2 e-Business Applications – (CRMs, ERPs, eMarkets, SCMs, ASPs, Portals)

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2.1 Introduction

e-Business applications are the key enablers of e-business strategies. Through these applications, businesses are incorporating the Internet into every process, from sales and marketing to manufacturing and procurement to supply chain management and new product development. Significant activity is in B2B trade that automates and streamlines communications, transactions, and collaboration with customers and suppliers. According to a Forrestor 1999 report, the value of B2B transactions conducted on the Internet dwarfs the value of consumer-oriented transactions by a factor of 20. Thus organizations increasingly serve as nodes on trading networks that rely on the Internet to exchange and process information between trading partners. At the core of this activity are e-business applications and associated models, the focus of this chapter, that offer the buyers and sellers a wealth of decision support tools for price and product comparisons, negotiations across a wide range of merchants, and a wide range of channels to market products and deliver enhanced services to customers.

To look at the current and future e-business (EB) applications and models, we take a "Next Generation Enterprise" (NGE) view because NGEs rely almost exclusively on the Internet-based infrastructure to conduct business. As stated in Chapter 1 of the Overview Module, a Next Generation Enterprise (NGE) utilizes the innovative new business models (e.g., real-time enterprises, virtual operations, intermediaries, self-serve customers, mobility, and dynamic business partnerships) by fully exploiting and integrating the next generation technologies to conduct business. In essence, NGEs are real-time digital corporations that rely on the underlying IT infrastructure (networks, computing platforms, middleware) to conduct 80 to 90% of their business [Umar 2000].

This chapter expands on the applications and models that were introduced in the previous chapter. After a quick overview, we take a closer look at portals, customer relationship management (CRM), online purchasing, electronic marketplaces and trading hubs, supply chain management, enterprise resource planning (ERP) systems, outsourcing through service providers (e.g. ASPs), and mobile applications. The focus is not on technologies, but rather on the models and applications that serve as the key enablers of business strategies.

Key Points

- e-Business applications are at the core of the modern real-time digital corporations (NGEs).
- NGEs with emphasis on real-time operations require transactional data from all portions of their business (C2B, B2E, B2B).
- Many e-business applications span C2B as well as B2B operations. For example, many online purchasing systems involve a customer to business as well as several suppliers who can handle backorders.
- Although the applications differ from each other, several common attributes can be found.
- A generic architectural framework can represent a wide range of EB applications. The business logic can change but the overall architectural framework is the same.
- Supply chain management and CRM are getting most attention for real-time enterprises because monitoring of these two activities can directly impact external interfaces (business boundaries).
- Most mobile applications are not fundamentally new applications, instead they are typical EB applications with mobile interfaces -- called MEBAs (Mobile EB Applications).
- Increased number of service providers enable outsourcing and can easily lead to virtual and real-time enterprises.

2.2 Case Study – XYZCorp Identifies e-Business Applications

XYZCorp needs to identify the e-business applications that will support the business strategies. As a result of the XYZCorp Case Study exercise in the previous chapter, XYZCorp has embarked on a major e-business initiative to compete in the marketplace by cutting down the production time by 30% and to reduce customer churn by 100%. To support this and other initiatives identified previously, you have been asked to identify between 10 to 20 applications (new as well as existing) that will be critical to the corporation, why these applications will be needed, and how they will be linked together to achieve corporate goals. Specifically, the company wants to know answers to the following questions:

- Can an online purchasing system be used for XYZCorp?
- Will emarkets be of any value to the company? Why or why not?
- Can an enterprise portal be developed that can be used by internal as well as external users?
- Can the portal be used for customer relationship management? Why or why not?
- Is there a need to develop mobile applications? Why or why not?
- What needs to be done to improve the current supply chain?
- What can be outsourced and why? Can you suggest a decision table or decision tree that can be used to make the outsourcing decisions?

2.3 e-Business Applications – Another Look

Figure 2-1 shows yet another view of the C2B, B2B, B2E, C2C, and other EB patterns that we discussed in the previous chapter. Let us revisit the main ideas before discussing the applications that support these patterns:

- **Customer to Business (C2B):** In this case, the customers (consumers) buy, sell, and receive other business services from the businesses. Examples include several ".com" companies such as Staples.com (for buying office supplies online), ebay.com (a popular site for buying numerous products), shop.com (for buying groceries), and Flowers.com (for buying flowers). This pattern covers two parts:
  - **Consumer information services** that concentrate mainly on providing information to the customers. This includes Web advertising and customer support, as an example.
  - **Consumer online purchasing** that allows customers to buy goods and services online. This is at the core of C2B e-commerce.
- **Business to Business/Government (B2B or B2G):** In this case, businesses interact with each other for activities such as order processing, purchase systems, inventory management, billing/payment, shipping/receiving, and supply chain management. Examples of B2B activities can be found in companies that use traditional EDI (Electronic Data Interchange) systems for order processing and invoices, as well as Amazon.com and Dell Computers that rely heavily on information technologies to conduct business between partners. One of the businesses may be Government, thus the term B2G is used in this context. (B2B/B2G) activities fall into two broad categories:
  - **B2B direct** where the business activities are conducted directly between trading partners. This includes the typical supply chains and exchanges between businesses and their partners where the parties know each other and have established business relationships with them.
  - **B2B indirect** in which the trade partners use emarkets as intermediaries. This is also known as **Business to Network (B2N)** interactions where you interact with *a* trading network (B2N). In a B2N environment, you may be interacting with anyone on the network. In real life, it is similar to going to a shopping center where the actual shops may change. Emarkets are examples of B2N trading because suppliers and buyers can form a trading network to buy and sell from each other.
- **Business to Employee (B2E):** This represents the internal business services of an organization and involves applications that have been known as "back-end" applications such as payroll, material requirement planning, marketing information systems, etc. Enterprise Resource Planning (ERP) is part of B2E.

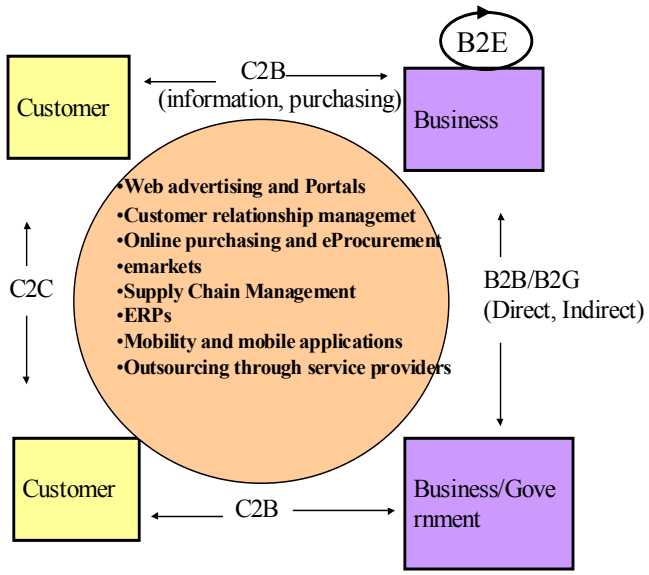

Figure 2-1: Conceptual Model of Modern E-business

- **Customer to Customer (C2C):** In this case, the customers (consumers) conduct business with each other directly or through intermediaries. Examples are auction sites such as E-Bay and trading hubs such as COW.com. As compared to B2B and C2B activities, C2C activities in E-business are relatively new but expected to grow in the marketplace.

The exchanges between the players (consumers and businesses) can be two tiered (C2B, B2B, C2C) or three tiered (C2B2C, for example). In some cases, such as supply chains and trading networks, there can be n-tiered exchanges where n>2. The portals, customer relationship management (CRM), online purchasing, electronic marketplaces and trading hubs, supply chain management, enterprise resource planning (ERP) systems, service providers (e.g. ASPs), and mobile applications support C2B, B2B, and other business patterns as shown in Table 2-1. The top row of this table shows the various business patterns that we discussed in the previous chapter. These business patterns are a good way to introduce the EB applications. In reality most common EB applications are ***"composite patterns"*** that comprise the basic patterns we discussed in the previous chapter. This table shows, for example, that Web advertising can be described in terms of C2B-Information, B2B-Direct, and B2E. We will explain the entries in this table in the balance of this chapter. In addition, NGEs with emphasis on real-time operations require transactional data from all portions of their business (C2B, B2E, B2B). Thus vendors are attempting to spread solutions across applications (see the sidebar "e-Business Applications for Next Generation Enterprises").

Table 2-1: e-Business Applications in Terms of Business Patterns

Business Patterns / EB Applications	C2B-Information	C2B-Purchasing	B2B - Direct	B2B-Indirect	B2E	C2C
Web advertising and Portals	x		x		x	
Customer Relationship Management (CRM)	x		x	x	x	
Online Purchasing and EProcurement	x	x	x	x	x	
Electronic marketplaces and trading hubs	x	x		x	x	
Supply Chain Management			x	x	x	
Enterprise Resource Planning (ERP) systems					x	
Data Warehouses and Data Mining	x	x	x	x	x	x
Outsourced applications	x	x	x	x	x	x
Mobility and mobile applications	x	x	x	x	x	x

Before proceeding, let us take a quick look at a generic architectural view of EB applications shown in Figure 2-2. This architectural framework shows EB applications as a multi-tiered client/server (C/S) model in which two integration layers surround the business logic. The front-end integration layer takes into account the wide range of devices (laptops, Web browsers, PDAs, cellular phones) and applications (desktop or mainframe-based) that you need to communicate with. The back-end integration is used to connect to various local as well as remote (external trader applications and databases). Notice that both integration layers are triangular, i.e., the integration glue is thin in some cases but quite thick in others. For example, integration with Web-based applications requires less effort than a mainframe-based application. The integration effort also depends on whether you are interacting with local (i.e., within the same enterprise) or external applications. This architecture can be used to study the inter-plays between the infrastructure components and to study integration/migration issues, and to address operational issues such as performance, fault tolerance, security, and manageability.

We will use this architecture throughout this chapter as a framework to illustrate how various EB applications can be viewed as specialization of this view.

The reader should be reminded that the focus of this chapter is on applications and models and not on deep technical/architectural issues. We present technical and architectural issues only as sneak previews of what is covered in the balance of this book.

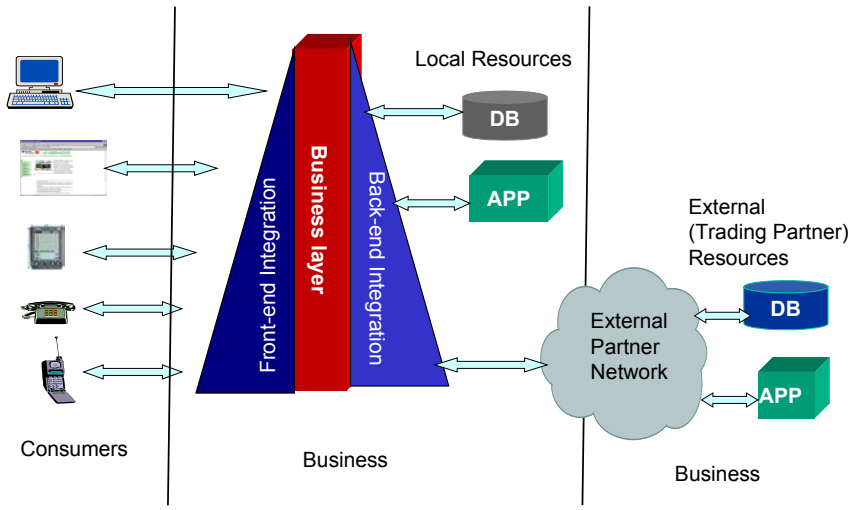

Figure 2-2: An Architectural Framework for e-Business Applications

e-Business Applications for Next Generation Real-time Enterprises

The race for real time digital corporations is stimulating diverse technical sectors such as CRM, ERP, business intelligence, and supply-chain solutions. For instance, enterprises are becoming far less interested in historical and transactional data from just one portion of their business. Thus vendors are attempting to spread solutions across applications. Analytics -- the field of providing business analysis tools -- is not limited to one department, instead the focus is now on digesting data extracted from real-time applications across the enterprise.

Business partnerships have been formed to provide enterprise-wide views. For example, Alphablox has formed a partnership with IBM to integrate Alphablox's infrastructure software into IBM's WebSphere application server for enterprisewide functionality. Similarly, application vendors are amending offerings to align themselves to real-time enterprises. Yantra Corp., for example, unveiled a new version of its Multi-Enterprise Commerce Management Suite -- an order and inventory management package that combines data in real time across enterprise divisions and external channels. Similarly, supply-chain company CommerceEvents is offering its AdaptLink integration platform that builds in a real-time response to events such as shipment cancellations or incomplete orders, while providing support for Web services, wireless, and AIDC (Automatic Identification and Data Capture) technologies.

Two applications are getting most attention for real-time enterprises: supply chain and CRM. For example, APL Direct Logistics, a Jacksonville, Florida-based fulfillment company that ships merchandise to consumers, has installed a real-time enterprise software package for real-time supply chain tracking. APL uses a real-time system from Yantra, Inc. to move data across payment processing, authorization, and settlement systems and trigger alerts if packages do not arrive at their destination as promised. The company has eliminated batch feeds to its suppliers. CRM systems are already offering functionality to link together companies, customers, and suppliers to form the basis for achieving the real-time enterprise. Companies such as General Electric are using real-time wireless solutions that are linked to their technical service reps in

the field to meet customer support-level agreements. These reps report savings of one hour per day as needed information gets delivered to them wirelessly in real time.

Sources:
- Jones, J., "Real Time's Trickle-Down Effect", Infoworld , January 17, 2002
- Goldenberg, B., "The CRM Evolution", CRM Magazine, April 2002

The Agenda
- Portals and CRMs
- Online Purchasing and eMarkets
- ERPs and Supply Chain Management
- Data Warehouses and Outsourcing
- Mobile Applications and M-Commerce

2.4 Portals: From Web Sites to View Integration

2.4.1 Overview

Simply stated, a portal is a Web site that serves as a doorway to a specific topic - ranging from space programs to gardening. Specifically, portals are intermediaries that offer an aggregated set of services for a well-defined (we hope!) set of users. Portals are reasonably popular in modern enterprises (they were very popular circa 1999). The oldest and perhaps still the best known portals are the Web search engines such as Yahoo and Lycos that allow users to search the Web sites for information. Over the years, the portals have evolved into Web sites that offer, in addition to Web searches, a broad array of resources such as Email, forums, online shopping malls, and personalization tools. Advanced portals combine Web documents, databases, applications, visualization tools, search engines, integration technologies, speech recognition, and natural language processing to give users an integrated view.

A portal includes a set of integrated programs designed to make it easier for a user to find information and, if needed, to conduct business or personal interest activities (e.g., shopping, setting up meetings, chatting). Typically these programs offer at least the following core features (see Figure 2-3):
- Web searching and Web advertising (e.g., home pages, banner ads, etc.)
- News about the topic of your interest
- Reference tools and specialized assistants ("wizards") to help with your chores (e.g., scheduling meetings, calendaring, video conferencing)
- Access to online shopping venues and, if needed, to back-end systems and services
- Some communication capabilities such as email, chat rooms

The purpose of all these integrated programs is to provide convenience, and a sense of community to the user, and to help make the user feel more comfortable about using the portal for the purpose of beginning his/her journey. So in this sense the portal is offering a valuable time-saving service. Of course, the purpose of the portal builder is to make sure that you conduct *all* of your activities by using the portal, thus capturing your "behavior" that could later be used for marketing. By offering visitors a portal to a specific topic, the portal vendor can control the results the user gets when he/she searches for a keyword. The links returned are the links that the portal vendor wants to return. By virtue of the free community building tools such as email, chat and forums, it also gives the visitor a way to communicate with the portal owner and ask questions and make comments about a specific topic. The advantage to the vendor, of course, is that by addressing these

questions and comments, it gives the vendor an opportunity to become a trusted expert on a specific topic. Once a portal community has been established, then many suppliers may advertise on your portal about their product or service that relates to the community. This not only produces revenue for the portal vendor but again offers a valuable service to the visitors that keeps them returning to the portal site.

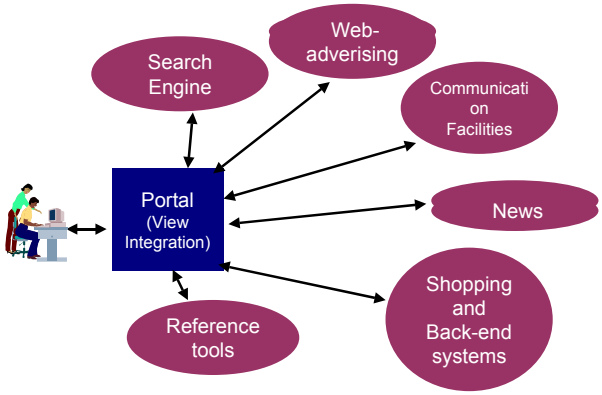

Figure 2-3: Conceptual View of Portals

2.4.2 Classes of Portals

Portals can be, as shown in Table 2-2, Internet-based or enterprise-based. Internet portals provide uniform access to the information on the Internet, while enterprise portals provide a similar uniform access to the information systems and processes of an enterprise. In addition, portals can be directed to horizontal or vertical markets. Due to our emphasis on E-business, the enterprise portals are of particular interest to us. These portals are usually aimed at employee productivity and can be designed for employees and contractors, for customers, or for trading partners. An example of enterprise portals for trading partners is the GM/Commerce One alliance that ties together more than 1000 partners. In fact, enterprise portals are beginning to look a lot like the emarkets that we will discuss later. Let us review these portals in a little more detail:

Table 2-2: Taxonomy of Portals (Source: Gartner)

	Horizontal	Vertical
Internet-based	Eyeball aggregators such as Yahoo, Infoseek, Lycos	"Vortals" such as eBay, CNET, Ivillage, E-LOAN, E*TRADE, Sportsline
Enterprise-based	Horizontal Enterprise Portals such as Verticalone	Enterprise Portals such as Space.com, WebMD, and VerticalNet

Eyeball Aggregators (Mega/Super)Portals. These portals are Internet Portals that provide horizontal aggregated services. Known as eyeball aggregators or "Mega/Super Portals", these portals originated as the Internet search and navigation tools. Examples of these portals are Yahoo, Lycos, AOL, and Infoseek. Initially, the Internet Portals provided a "window" from which users could find and view desired content. However, they have evolved into powerful sites that offer a wide array of online resources and services such as personalization services, communities of interest, free email and chat rooms, and direct access to specialized functions, such as shopping networks, auctions, and online trading sites. The Internet portals are becoming MegaPortals due to consolidation.

Vertical Portals. Vertical Portals, also known as "Vortals", focus on a specific industry or community, and were the fastest growing segment of Internet Portals. Vortals provide the same core functionality as Internet Portals, but are targeted to a specific industry or niche:

- aggregation of relevant content
- links to related industry, supplier and even competitor sites
- community and collaboration capabilities
- e-commerce services for products and services relevant to the industry

Examples of vertical portals include telezoo.com in the area of telecommunications, cnet.com for computer-related technologies, webmd.com in healthcare, and many others. Verticalnet.com is an interesting vortal for several vertical marketplaces. In addition, vortals such as eBay and E*TRADE are popular for auctions and trade.

Enterprise Portals. Enterprise Portals, also known as corporate or transaction portals, provide a door into an enterprise's information, applications and processes. Enterprise Portals personalize and aggregate the corporate computing resources primarily for its employees. In some cases, enterprise portals are built for the customers and partners. The focus of enterprise portals is on improving the productivity of its employees thus they provide work related aids that may include conducting business transactions. Typical enterprise portals provide a personalized view, based on the role of the employee, of the following services:

- access to applications and transactions needed by the employee to conduct work
- information retrieval tools
- PC desktop services
- communication services such as email, instant messaging, voice over IP

For example, an enterprise portal for financial analysts may provide facilities for stock analysis, trading, and settlements, in addition to the email, fax, news, calendaring, and video conferencing services. Enterprise Portals can provide integrated applications access, information management and knowledge management within enterprises as well as between enterprises and their partners, suppliers, and customers. At the time of this writing, enterprise portals are starting to integrate enterprise resource planning (ERP) systems, such as SAP and PeopleSoft, through thin client access such as mobile devices. These portals are also providing support for mission-critical operations. This includes support for application integration, process and workflow management, and aggregation of resources (information, applications, services, communities) relevant to the context or task being performed.

An extensive discussion of portals for e-business can be found in the book by M. Davydov, "Corporate Portals and e-business Integration", McGraw-Hill Professional Publishing; 2001.

2.4.3 Portal Architectures and Software

Many software packages are becoming commercially available for development and deployment of portals. Examples include Brio Technology's Brio.Portal (www.brio.com) and Sterling Software's EUREKA:Portal (www.sterling.com). These packages typically include facilities for uniform user access, administration, publishing, and integration with back-end systems. At the core of portal software is a repository that serves a variety of Java and XML tools. Portal software packages are typically beginning to support transactions needed for enterprise portals, personalization services, and access to random information, such as Word documents or marketing literature, across the enterprise stored in diverse formats such as HTML, XML, ActiveX, multi-media, and others.

Many portals at present use large HTML files that contain information from a variety of sources (content providers). The customers access these HTML files through the portal front-end and browse information based on certain browsing rules. In practice, however, the portals may also directly connect with remote content providers through an integration layer. Figure 2-4 shows such an architecture (note, once again, that this is a specialization of the architectural framework shown in Figure 2-2). According to this architecture, the front-end of a portal must be able to handle a multitude of users and devices while the back-end must be

able to communicate with multiple content providers. The middle tier provides the content consolidation and can use the customer profiles to customize the presentation.

Enterprise Portals For Enterprise Integration

Enterprise Portals, as stated previously, personalize and aggregate the corporate computing resources primarily for its employees. Enterprise portals can be used to provide an integrated view of all enterprise systems. This is known as view integration, i.e., present a single view even if the back-end systems are very diverse, reside on different platforms, and use different technologies. In most cases, the Web browser serves as a view integrator that seamlessly invokes back-end applications and databases. An extensive discussion of portals for e-business integration can be found in the book by M. Davydov, "Corporate Portals and e-Business Integration", McGraw-Hill Professional Publishing; 2001.

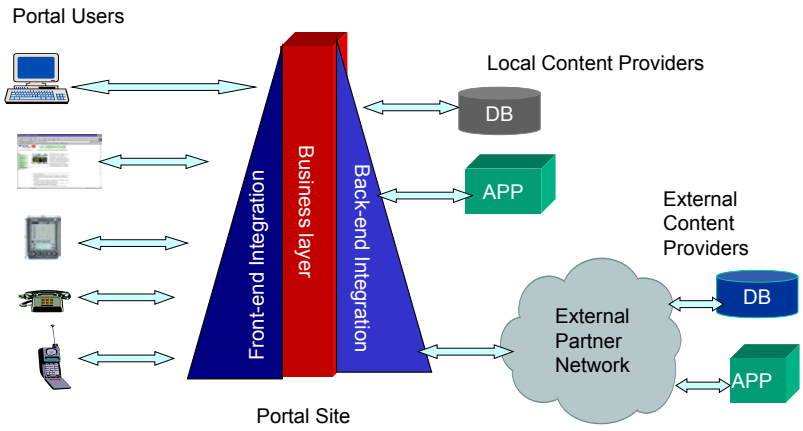

Figure 2-4: High Level Architecture of Portals

2.5 Customer Relationship Management (CRM) Systems: Keeping Customer in the Forefront

2.5.1 What is Customer Relationship Management

Simply stated, *Customer Relationship Management (CRM)* is "a management approach that enables organizations to identify, attract and increase retention of profitable customers, by managing relationships with them", (Source: "CRM Strategies", Ovum Report, 1999). CRM systems are an outgrowth of the traditional customer care systems that concentrate on customer loyalty through improved service and communication. The average firm loses 10% of its customers each year due to poor service [Reichheld 1996] and sales personnel can spend up to 40% of their time coordinating and managing major account interactions -- stealing time from revenue-generating activities [Aberdeen-CRM 2000]. As products and services become harder and harder to differentiate, CRMs have become a source of revenue, profitability and value. A study conducted by Andersen Consulting in the Telecom industry found a direct link between CRM improvement and financial improvement of surveyed companies – CRM performance accounts for 50% of the companies' return on sales [Raaen 2000]. The sidebar "How Important is Customer Retention? " lists some of the regularly quoted numbers about the importance of customer retention. Even if you do not believe all these numbers, the overall message is quite clear.

At present, CRM has evolved into a collection of methodologies, software, and Internet capabilities that help an enterprise manage customer relationships in an organized way. CRM applications, often used in combination with call centers, data warehousing, and E-commerce applications, allow companies to gather and access information about customers' buying histories, preferences, complaints, and other data so they can better anticipate what customers want and need. Due to these reasons, ***data mining*** has become a cornerstone of CRMs. The main idea is to analyze the customer data to discover desirable as well as undesirable behaviors, symptoms, and trends. A great deal of work on data mining for CRM is being done at present (see, for example, "Building Data Mining Applications for CRM" by Alex Berson, and the Knowledge and Data Discovery Conference proceedings). We will review data mining later (Section 2.10).

CRMs typically consist of a database of customers with sufficient details that can be used by management, marketing, and work force (technicians, service representatives) to:

- Assess customer satisfaction/dissatisfaction and match customer needs with product plans and offerings.
- Determine what products a customer had purchased to identify best customers, develop effective marketing campaigns, and generate quality leads for the sales team.
- Improve telesales and streamline existing processes (for example, taking orders using mobile devices).
- Form individualized relationships with customers and identify the most profitable customers for highest level of service.
- Provide employees with the information and processes necessary to know their customers and understand their needs.

CRMs must meet the needs of modern customers who access the company through emails, call centers, faxes and Web sites. These customers demand immediate response and a personalized touch. Meeting their needs places new demands on the enterprise. Since traditional enterprise resource planning applications did not include a customer management aspect, CRM was the logical next step.

The current focus on keeping customers coming back is much more intense than the customer satisfaction efforts of the 1970's. The customer satisfaction initiatives often ended with a common means of *measuring* customer satisfaction -- not necessarily means of *improving* customer satisfaction. CRM is also broader than the age-old principle that "the customer is always right." Instead, CRM assumes that not all customers are always right -- it helps you to identify the classes of customers that need different levels of attention. In other words, CRM concentrates on providing optimal value to "optimal" customers. It is obvious that the customers make buying decisions based on more than just price – their buying decisions are based on their experience that includes product and price, but also includes sales, service, recognition and support. For ongoing customer loyalty and value, companies must consider all these factors (i.e., price, product quality, service, and support).

How Important is Customer Retention?

It is obviously important to build systems that keep the customers happy. Here are some pieces of information to highlight the stakes:

- By some estimates, it costs five times more to obtain a new customer than to keep an old one.
- Twenty-five percent of customers generate 85% of profits.
- It is not enough to just take orders from customers (anybody can do that). It is important to work intimately with the customers to explore new needs.
- It costs 6 times more to sell to a new customer than to an existing one.
- A typical dissatisfied customer will tell 8 to 10 people.
- A company can boost its profits by 85% by increasing customer retention 5%.
- The odds of selling a product to a new customer are 15% versus 50 % to an existing one.
- 70% of complaining customers will do business again with the same company if it quickly takes care of the problem.
- Example (Source: Knowledge Stream Partners) X wireless was adding 1.5 million customers/year but losing 900,000 customers/year. Because of the very high cost of getting new customers, the company was reportedly losing $600,000,000 per year.

General Sources: [Kalakota 2000, Gartner, Forrestor].

2.5.2 Short Examples of CRM

Dell Computer has deployed its Premier Page Program to over 5,000 corporate customers. The program allows Dell to enhance its successful direct-sales practices by leveraging the Web to offer a hybrid solution combining enhanced order management capabilities (product configuration, personalized pricing, order status, and shipment tracking) with customer relationship functionality (contact information, document repositories, real-time access to customer/technical assistance). The returns are quite good: Dell reports that approximately $5 million worth of Dell PCs are ordered daily via Premier Pages and account for nearly 40% of Dell's daily online revenues. Further, customers report higher satisfaction levels and intentions to make Dell their sole source for PCs.

Boeing PART Web is a catalog of repair parts, price, inventory level, order and delivery for authorized customers only. The main driver for this effort is competitive edge -- repair parts are also available from OEMs, not only from Boeing. The pricing for a customer is based on its contract with Boeing.

AMP Electronic Connector, Inc. (http://connect.amp.com) uses Web-based Online Catalog and Sales for CRM. The site supports 142,000 registered customers from 145 countries, two-thirds of those are engineers. The catalog contains 90,000+ components with 3D-models, specification charts, and design drawings (design drawings(pdf) are allowed to be re-used by customers). The search engine is multilingual. Questions can also be submitted via Email.

Telenor Mobil, via its Online Dealer extranet system, allows 1,300 dealers and 10,000 users to begin a two-way electronic dialogue, including order entry with Telenor. The Telenor system allows dealers to sign up customers instantly, reducing phone activation times from 10 days to a few minutes.

Many companies offer price incentives for customers to use its Web-based services (this also allows capture of important customer data). For example, AT&T offers a 9-cent-per minute rate for domestic long distance -- instead of its usual 10-cent rate -- for customers who use their internet billing service.

For ongoing developments, examples, and case studies in CRM, see the following:

- (www.crm-forum.com) – This site contains news, product announcements, and a library of products and literature.
- (www.crmcommunity.com) - This site has a very large number of papers and reports on CRM.
- zdnet.com/techupdate/ - Good for trends and technical updates on CRM.
- CRM Guru (www.crmguru.com) -- A good site for tutorials on CRM.
- www.knowledgestorm.com -- This site has a great deal of information on CRMs

Government Relationship Management (GRM) – Your Government Loves You

Citizens, for some strange reason, are expecting more from their government agencies. It is very nice to know, for example, where your car was towed to, how many parking tickets have not been paid yet, how some of the new regulations can impact your business, etc. To respond to this market need, the governments are also becoming more "customer oriented." As part of the e–government initiatives,Government Relationship Management (GRM) systems are being developed to help government agencies view themselves through the eyes of their constituents. IBM, for example, has an active practice in “Citizen Relationship Management” that provides a variety of services to assist government agencies in their job (http://www-1.ibm.com/industries/government/doc/content/solution/262302109.html). Additional information can be found at http://www.e-government.com/.

2.5.3 Why CRMs?

Several trends have brought CRM to the forefront. First, as global competition has increased and products have become harder to differentiate, companies have begun moving from a product-centric view of the world to a customer-centric one. Second, technology has matured to the point where enterprises can store the complex and diverse customer information into a single system instead of 20 different systems. Finally, the Internet technologies allow diverse users and employees to access the customer information through a variety of devices.

The real impetus for CRM in today's environment is competitive differentiation. It is increasingly difficult, if not impossible, to compete on the basis of product because technology advancements have enabled the near-immediate replication of product features and functions. For many products, the time lag between a new product launch and saturation of the market is weeks, not months, with very few truly unique products. Other market differentiators such as price, promotions, and distribution sites are still important, however, none of them can alone support the success of most businesses. Here are the reasons:

- Price, which has traditionally been a basis of competitive differentiation, is no longer a means for many to compete. Trading hubs and electronic marketplaces have considerably complicated the pricing issue.
- Promotional strategies have also lessened as a means of differentiation due to abundance of clubs, special offers and sales.
- Distribution sites are also less influential in the success or failure of a business because customers can buy from a "virtual" enterprise that only exists on the Web. In addition, even the smallest businesses can compete in the Internet economy.

Due to these reasons, CRMs are vital means of differentiating by attracting customers to frequent your business rather than that of your competitors. Simply stated, the goal of CRMs is to instill greater customer loyalty. Other reasons for CRM include (http://www.techweb.com/se/directlink.cgi?IWK19990927S0057):

- Having a deeper knowledge of customers
- The ability to provide faster response to customer inquiries
- Identifying the most profitable customers
- Increased efficiency through automation
- Getting more marketing or cross-selling opportunities
- Receiving customer feedback that leads to new and improved products or services
- Doing more one-to-one marketing
- Obtaining information that can be shared with the company's business partners

The basic idea is that in the current highly competitive and volatile environment, the successful providers will specialize in customers rather than in the products that they may sell to customers. Several customer-focused business models are being formed by companies such as of Amazon.com (beginning with books, but now also offering a wide range of other products and services to their customers), Dell, Starbucks, and others. The success of these efforts depends on their ability to continually monitor and understand customers' needs, and then match to products and services that best meet those needs. In addition, membership associations, such as AAA, AMA or AARP have expanded their services to offer a wide range of products and services to meet their members' needs.

It is important for companies to remember that customer relationship management is not a cost center but a competitive differentiator.

2.5.4 Issues in Building CRM

CRM, as stated previously, involves optimizing product, price, place of distribution, promotion, sales and service. This is easier said than done. In reality, CRM is difficult because it is an enterprise-wide initiative that requires a combination of marketing, sales, service and technology, as well as the other inner-workings of an organization. Needless to say, getting all these areas of organization to not only exist in harmony, but to be working toward the common goal of stronger customer relationships is a non-trivial task. Having even one area of the organization that is less than committed to CRM can create difficulties. CRM initiatives are consequently best handled through top management support.

Figure 2-5 shows a typical management cycle of planning, organizing, execution, and monitoring of CRM. The main idea is that CRM needs to be managed as a key organizational activity.

According to the Aberdeen Consulting (www.aberdeen.com) practice on CRMs, there are five inter-related areas. These include:

- **Transforming the Business Focus** of an organization essentially means getting the organization to buy in to the customer-focused paradigm. This implies that the business focus may shift from "How can we increase the sales of our products," to "What do our customers need, and how can we meet those needs?"
- **Changing the Organizational Structure** of a company should follow the change in business focus. Many organizations retain a product focus, with product managers driving business decisions. In these organizational structures, product managers compete with each other even when the same customer is involved. A customer-focused organization should be centered around customer segments with customer segment managers responsible for the acquisition, retention, and growth of different segments of customers. This often means that the existing product or channel structure needs to be augmented with customer management staff, and additional headcount.
- **Transforming the Business Metrics** implies a shift from product performance metrics to customer lifetime value and loyalty. Rather than measuring product profitability and sales figures, the focus needs to shift to questions such as "Do we have profitable relationships with our customers? How can we make these relationships more profitable?"
- **Changing the Marketing Focus** from mass marketing to interactive one-to-one dialogue is also essential. Thus it is important to keep the human touch in this world of technology.

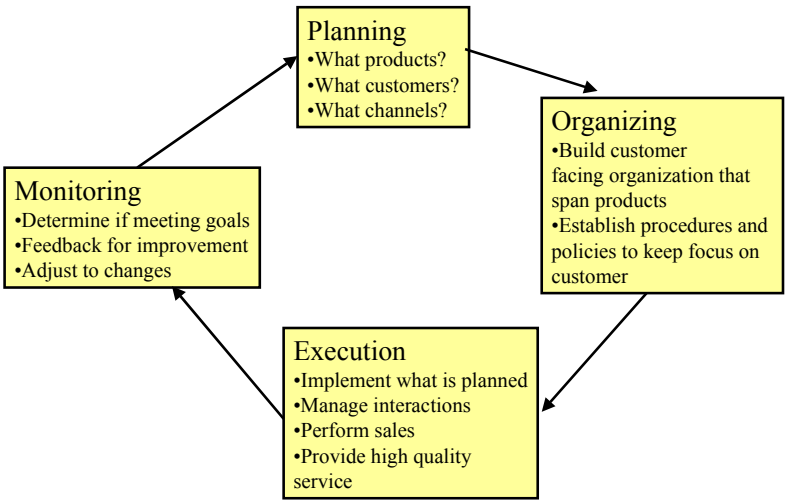

Figure 2-5: Managing CRM

- **Technology Transformation** is needed to support and enable meaningful customer dialogue at all points of contact. This involves databases, Web technologies, and several other technologies we will discuss later.

It is important to keep in mind that all of these areas need to change for an effective CRM solution. For business issues in planning and implementing CRM, see the Web sites of the growing segment of CRM professional services such as Aberdeen Consulting, Andersen Consulting, Cambridge Technology Partners, CSC, Deloitte Consulting, EDS/Centrobe, eLoyalty, Ernst & Young, IBM Global Services, KPMG, and PriceWaterhouseCoopers. IDC consulting (www.idc.com) publishes reports on CRM regularly.

2.5.5 CRM Technologies and Architectures

Technically speaking, designing CRMs is similar to designing many Web-based information systems. The specific issues to be considered for CRM design include the following:

- Information access and exchange issues such as what information needs to be shared, in what form, with whom and under what type of controls.
- Communication process management issues, given the complexity of inter-team communications, communications rules (i.e., who manages the communications flow between and among teams) and communications tracking.
- Transaction management issues such as what is currently on order, what is the delivery status, and what are the open issues.

CRM software is currently provided by vendors such as Siebel, Vantive, and Clarify along with ERP vendors Baan Co. and Oracle Corp. A conceptual view is presented in Figure 2-6 in terms of the typical layers (presentation, business logic, and integration). Most vendors include at least the following elements:

- **Web**: The most important use of the Web from the CRM perspective is self-service so customers can make inquiries about their accounts any time from anywhere. The Web should also be used for Electronic Bill Presentment and Payment (EBPP), so customers can see what they owe and pay online if appropriate. For revenue-enhancement, companies can also provide instant messages to be used for cross-selling and up-selling services based on the profiles of customers using their Web site.
- **Interactive Voice Response (IVR)**: An IVR system is required for customers to do self-service inquiries via the phone instead of the web.
- **Call Center Technology**: Some type of call center technology with PBX or VoIP (Voice over Internet Protocol) integrated with intelligent call-routing is crucial for interfaces with the live Customer Service Representatives.
- **Business Rules**: Business rules are needed to ensure that any transaction with the customer is processed in an efficient manner. For example, if a company wants the most profitable and high volume customers to be serviced by experts, the business rules should clearly define what that criteria is. Based on the complexity of transactions, an organization may need hundreds of business rules.
- **Customer Database:** This contains the complete customer information that includes customer profile, products bought, complaints filed and issues raised by the customer, and any other pertinent customer data.
- **Integration framework**: A technology framework that allows all the applications and databases that have customer information to be integrated can make a big difference in implementation.
- **Additional Databases, Data warehouses and Data Mining:** Managing relationships with the customers depends on customer information, which is usually in various disparate databases. You can access these sources through the integration technologies or develop a data warehouse. Consolidating the relevant information in one place and making sure that the information interrelates is not an easy task. Once done however, data warehousing augments a company's revenue potential and customer service. For example, a company can segment the types of customers it has in the data warehouse and launch a marketing campaign geared toward specific types of customers. Similarly, good data warehousing can help in presenting the information based on certain business rules to help in cross-selling and up-selling to customers calling for other reasons. Data mining of customer data (e.g., what they have bought, when) and Web mining (e.g., mining of clickstreams that show what Web pages the

customer visited before he/she bought something) are an essential aspect of contemporary CRM systems (see Section 2.10).

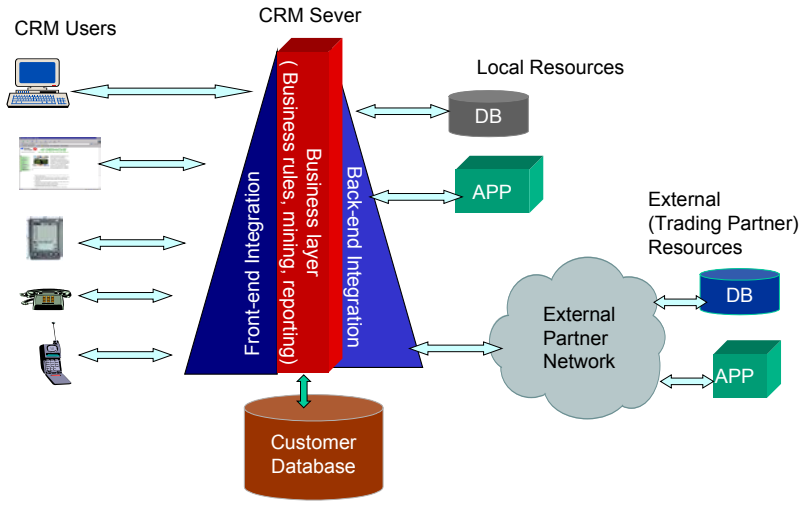

Figure 2-6: High Level Architecture of CRM

Companies can implement their CRM strategy through off-the-shelf CRM packages mentioned previously (e.g., Siebel, Vantive, and Clarify) that provide functionality at various levels. At present, most of these products are robust and comprehensive. However, companies still need to implement the right processes and integrate all legacy applications for a successful CRM program. Alternatively, companies can create their own applications and buy some technologies for certain key components like data warehousing. This solution usually takes much longer and is rarely more successful than buying off-the-shelf solutions. The companies can also outsource the CRM function to companies that can provide turnkey solutions. This helps companies eliminate the costs relating to their capital infrastructure for CRM and allows them to focus on their core competencies. Credible outsourcing companies guarantee results, which eliminates any risk for the companies in outsourcing.

Companies must allow customers to interface with them from any touch point that they are comfortable with i.e. Web, IVR, phone, or in-person meetings. Over-use of technology for the sake of technology can backfire and is potentially devastating. An appropriate combination of technology and people is the key to success.

An example is the Kovair's VIPCenter Web site with functionality as follows:

- A point-and-click interface;
- A searchable, platform-independent content library with change management facilities;
- An administration console providing content and access control;
- Contact list management facilities;
- Task lists with tracking by due date and owner, as well as automatic reminders;
- Automated email updates and notifications concerning content changes and approaching task deadlines; and
- Dynamically generated views - VIPCenter can provide tailored customer-centric views of the site to members of the customer team, while providing a different, sales-centric view to the sales staff.

Self Serve Customers

Self serve customer systems allow customers to receive services without interacting with the human representatives. Examples range from automated teller machines to e-tickets that the customers can use to get boarding passes on airlines without interacting with the representatives.

Self serve customer systems do not eliminate the need for customer care.

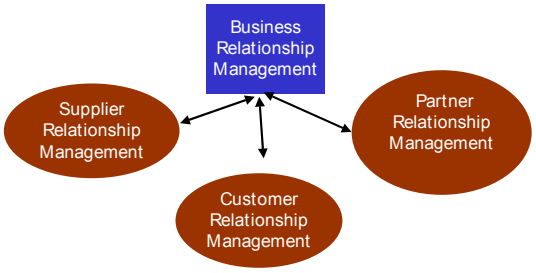

Figure 2-7: Customer Relationship Management as Part of Business Relationship Management

2.5.6 Extending CRM to Business Relationship Management

Customer relationship management (CRM) can be viewed as part of Business Relationship Management that includes all aspects of relationship management (see Figure 2-7). In particular, the partner relationship management and supplier relationship management are worth reviewing.

Managers of partner and supplier relationships face numerous challenges. These challenges have increased because EC/EB has significantly augmented the interaction and volume of activity between organizations and their partners and suppliers. Supplier and partner relationship managers require information that can help them to reduce the partner churn rates, increase brand equity, better leads, access to market intelligence, and better training and certification systems. Partner relationship management (PRM) and Supplier Relationship management (SRM) must keep track of all on-going negotiations and also keep a record of completed agreements. In typical interactions between the partners and suppliers of an organization, several teams are involved at various stages of negotiations. PRM and SRM must keep track of all these exchanges. Commercial products, such as the OnDemand B-2-B Portal, are beginning to address this market. In addition, many consulting firms that specialize in CRM are also beginning to provide PRM and SRM services.

Another aspect of CRM is sales initiative management. In a typical sales initiative, more than 10 staff members with different skills interact with the potential customers. This information must also be captured to better manage the sales initiatives and to improve the future initiatives. One could conceive an Initiative Relationship Management (IRM) for this purpose.

In short, CRM concentrates on customer relationship to gain a market differentiator – instead of the typical product focus. CRM can be extended to business relationship management that may include relationship management of partners, suppliers, and sales initiatives.

Sources of Information for Customer Relationship Management

- Dyche, J., "The CRM Handbook: A Business Guide to Customer Relationship Management", Addison-Wesley, 2001.
- Greenberg, P. "CRM at the Speed of Light: Capturing and Keeping Customers in Internet Real Time", McGraw Hill, 2001.
- Berson, A., "Building Data Mining Applications for CRM" McGraw-Hill, 2000.
- Seybold, P., "Customer.com", Wiley, 2001.
- "Implementing Next Generation E-business Strategies", Computer Technology Research Corp, June 1999.

- (www.crm-forum.com) CRM Forum site containing news, product announcements, and a library of products and literature.
- (www.crmcommunity.com) - CRMCommunity site has a very large number of papers and reports on CRM.
- zdnet.com/techupdate/ - Good for trends and technical updates on CRM.
- CRM Guru (www.crmguru.com) has good tutorials on CRM.
- (www.crmassist.com) Portal for CRM containing pointers to many CRM products (ITToolbox) and reports
- Fryer, Bronwyn, "SO HAPPY TOGETHER." CFO Magazine. June 1999 http://www.techweb.com/se/directlink.cgi?IWK19990927S0057.
- Baljko, Jennifer L., "CRM apps can enhance competitive position." Electronic Buyers News. October 11, 1999 http://www.idc.com/.
- http://www.amrresearch.com/ - Reports on CRM.

Time to Take a Break

- ✓ Portals and CRMs
- Online Purchasing and eMarkets
- ERPs and Supply Chain Management
- Data Warehouses and Outsourcing
- Mobile Applications and M-Commerce

Suggested Review Questions Before Proceeding

- Does it still make sense to characterize applications as C2B, B2B, and B2E? Why are applications spanning multiple business activities?
- What role do applications play in real-time enterprises?
- What are different forms of portals? What is the role of enterprise portals in e-business? Can portals play a role in integration?
- Why is CRM considered important in today's business? Is it only important for marketing?
- What are the variants of CRM systems and where can they be used?
- How is data mining related to CRM?
- What are the issues in managing and deploying portals and CRM systems?

2.6 Online Purchasing Systems: The Cornerstone of e-Commerce

2.6.1 Overview

Online purchasing is at the core of E-commerce because it represents online buying/selling through a an online catalog. It includes consumers, buyers, and suppliers engaging in on-line trade and includes links to

back-end systems for inventory updates and credit checking. As shown in Figure 2-8, the purchasing process consists of several steps that can be viewed in terms of pre-purchase, purchase consummation, and post-purchase activities. In the pre-purchase activities, the users browse through various sites, compare prices, and select the online-merchants they want to buy the goods from. Naturally, Web and the Internet have had the most profound impact on these activities. In the purchase consummation activities, the user may use a shopping cart and place an order by using a payment system. Naturally, the e-commerce payment systems play an important role in this area. The post purchase activities involve the classical "back-end" systems that handle payments settling, shipping and receiving, etc. Many of these applications are legacy applications that have been around since the 1970s and 1980s.

The main idea is that online purchasing systems span very new Web technologies as well as very old systems. Specifically, online purchasing involves a large number of Web based systems that allow users to search company catalogs for certain price ranges and then place orders for chosen product(s). These systems also need to support mobile users. In addition, the order processing, inventory control, payment, and shipping/receiving systems are employed. All these systems need to work together to satisfy the demands of online buyers and sellers. Due to this demand, several specialized middleware services are becoming available to support mobile computing and online purchasing and are also being packaged with other infrastructure services to form ***"Middleware Platforms".*** Examples of these platforms are ***e-commerce Platforms*** such as IBM's Websphere and Microsoft's Internet Commerce platform. These platforms are an area of tremendous activity and are discussed in great detail in the Platform Module of this book. Let us briefly review some common examples of online purchasing such as Web storefronts and virtual shops. A more detailed discussion of purchasing involving emarkets is given in the next section.

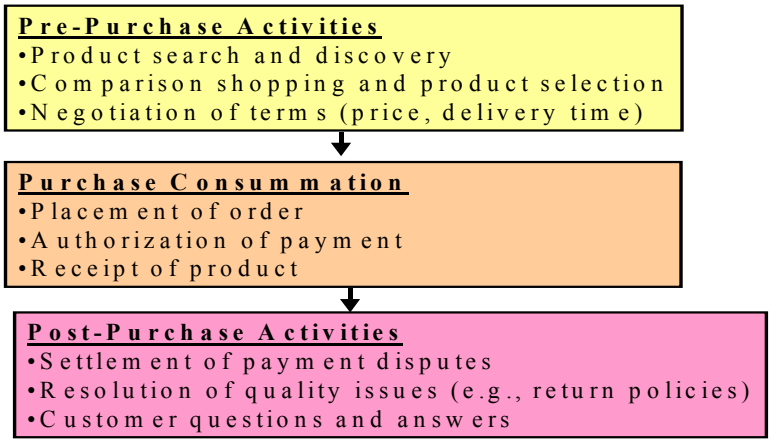

Figure 2-8: Purchasing Steps

2.6.2 Example of Setting Up a Simple Online Purchasing System – Bob's Bicycle Shop

Let us assume that Bob owns a bicycle shop and wants to sell his bicycles over the Internet. We are assuming that Bob does not want to develop any software or technologies himself. Here are the key steps.

Step 1: Set up a Web site. Bob can contact an ISP for Web hosting. An extensive list of ISPs and Web hosters can be found at the website (www.webhostdir.com).

Step 2: Get a domain name. Bob will have to get a doman name to be in business. A Web hoster can get Bob a domain name or Bob can do it himself by using the Web sites (www.allwhois.com) and (www.networksolutions.com).

Step 3: Get shopping cart software. Most e-commerce purchasing systems use shopping cart software. Bob can build or outsource his shopping cart processing by using the website (e-commerce.about.com), for example.

Step 4: Set up a payment system. Payment systems in many e-commerce sites take credit cards. Once again, Bob can connect to a service provider that specializes in credit card processing. Cybercash (www.cybercash.com) and Miva (www.miva.com) are examples of companies that provide a variety of credit card processing software as well as hosting services for credit card processing. But how does Bob get paid? Most credit card processors need a merchant account to transfer money into. Merchant accounts can be set up by banks, or Bob can use companies such as cybercash or authorize.net for setting up merchant accounts.

Step 5: Set up a Delivery System. Bob will also have to make arrangements to have the bicycles delivered to the customers. He can outsource this also to carriers such as Federal Express or UPS.

Bob can choose to outsource the entire process. Once again, the Web site (www.webhostdir.com) has a very large collection of possible service providers for e-commerce.

2.6.3 Web Storefronts and Virtual Shops for Purchasing

Web Storefronts. Web storefronts use the Internet to market and sell products and services to a global audience of customers. Web storefronts are limited to one seller, i.e., they enable a seller to use the Internet to differentiate its product offerings; enhance customer service; and lower marketing, sales, and order processing costs. For example, a shoe store can develop a Web Storefront that allows customers to purchase shoes over the Internet. As shown in Figure 2-9, storefronts support Web based purchasing systems that allow users to search company catalogs for certain price ranges and then place orders for chosen product(s). This represents online buying/selling through a catalog using a shopping cart, electronic wallet, or similar tool. It includes both consumers purchasing goods and online buyers purchasing goods from a supplier. It can also include links to back-end systems for inventory updates and credit checking.

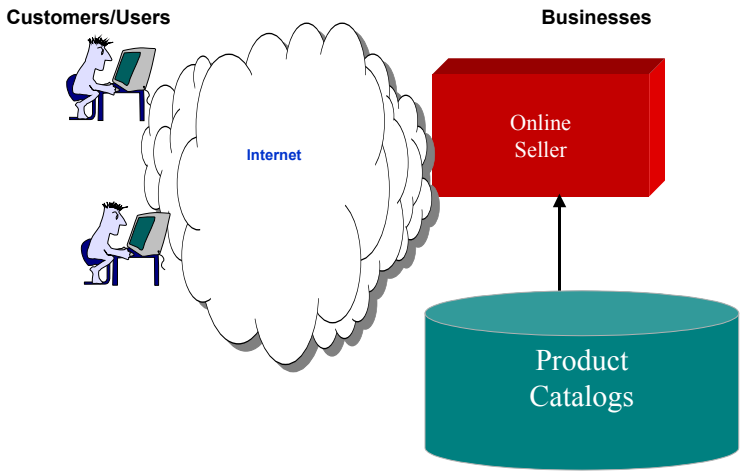

Figure 2-9: Online Purchasing Through a Storefront

A very large number of Web storefronts currently exist. Examples are:

- Staples.com -- for buying office supplies online
- E-Buy – for buying numerous products
- Shop.com -- for buying groceries
- Flowers.com – for buying flowers

Storefronts basically show a company's presence on the Web and are usually based on a product catalog that shows product features, price, expected delivery time, etc. These web-based sales solutions deliver process and cost improvements to sellers but they are very "supplier centric". These supplier-centric solutions can complicate efforts of customers to control expenditures and maintain preferred supplier relationships. For example, you may have to visit several storefronts to find a bargain.

Virtual Shops. Virtual shops go a step beyond the Web storefronts by providing a storefront that represents several back-end sellers. In other words, the restriction of a single seller is removed. For example, Amazon.com supports purchase of books by tying several bookstores together. Enterprises that support virtual operations are known as "virtual enterprises" or extended enterprises. Basically, a ***Virtual Enterprise (VE)*** is a network or loose coalition of a variety of value adding services in a supply chain, that unite for a specific period of time for a specific business objective, and disband when the goal is achieved. Examples of virtual enterprises, in addition to Amazon.com, are:

- Drugstore.com -- To buy drugs online (many partners)
- Virtual Parts Supply Base (VPSB, http://www.vpsb.com/) to supply hard to find parts for US Government.
- The National Industrial Information Infrastructure Protocols (NIIIP) Consortium to develop inter-operation protocols for manufacturers and their suppliers (for more information on NIIIP see http://www.niiip.org).

Virtual enterprises can be, if needed, customized to reflect a buying organization's unique trading agreements, workflow, and business rules. These virtual procurement channels, also known as *e-procurement*, enable a self-service purchasing environment that pushes product selection and order initiation to the desktops of frontline employees through a common Web browser. Many early e-Procurement solutions were intranet-based applications that did not fully leverage the ubiquity of the Internet. As a result, many e-Procurement solutions are now transitioning to e-markets. Many unique issues in virtual shops and virtual enterprise arise. An example is customer care. See the sidebar "Customer Care in Virtual Environments".

Customer Care in Virtual Environments

In the realm of Virtual Enterprises (VE), the concepts of Virtual Customer Care and Billing (CC & B)need special attention. In the VE, there is a temporary union of physically separate sites joined to fill the order of a retail/wholesale customer. The VE being truly virtual, maintains no warehouse, and probably multiple, semi-interactive billing systems, one to interface with the customer and others to interface with its 'suppliers'. Each of these suppliers would have its own customer care and billing systems, servicing its own products or services. The customer, interacting only with the VE, is unaware of these individual entities including their behind-the-scenes support, i.e., CC & B. He places the order, pays the bill, and expects care and support only from the VE.

Should a customer's problem arise, e.g., late or missing order, damaged goods, unwanted goods, bill adjustment, he should address a central CC & B facility belonging to the VE, a VCC & B sector, not necessarily located or associated with any of the suppliers. An optimal situation would be one in which the presence of a staff to address the customer's problem be kept to a minimum and provide as varied and flexible contact means as possible, e.g., conventional telephone, IVR, email, web, desktop. Here is a partial list of some available tools;

COS software (*k-Commerce Support*™ by *Inference*) is available which is knowledge-based using case-based reasoning (CBR). This package contains five solution modes for assisted and self-service access.

Desktop - conversation-based, helps CSRs answer questions.

Web - interactive, self-service, XML based and scalable.

Email - analyzes and answers customer questions; CSR can review before response is returned; can migrate to fully automated email response; routing, tracking and reporting available; can be integrated with web-

based solution.

Chat - interactive customer service; multiple customers simultaneously.

IVR - answers questions before reaching a CSR.

This appears to be useful on the 'front-end', receiving requests. It has some routing availability (for email only), but routing capabilities are not available for 800 number phone calls.

Scenarios will/can be created where an extension of this is necessary. Perhaps this software can be employed on multiple levels.

Scenario 1: A VE sells a variety of appliances, minor to major. One supplier provides only minor appliances, e.g., microwaves, TVs, toasters, etc. of various manufacturers. The customer purchases from the VE and then has a question concerning the operation of his new microwave. He calls the VE, the VE's software routes his request to the supplier, which has similar software to employ, routing the request via a mode to an automated solution, e.g., FAQ list, IVR instructions, CSR (live).

Scenario 2: A customer orders some books, cassettes and CDs from a VE. The items are warehoused by two suppliers. A tape arrives defective. The customer contacts the VE's customer service department with a complaint. After interacting with the customer's call/contact by the knowledge base, it is routed to the classical music division warehouse, where similar software interacts with the customer's contact. It instructs him to return the damaged tape to a particular address and provides him with a return goods authorization number (RGA), linked to his original invoice, for tracking.

2.6.4 Online Purchasing – A Closer Look

Figure 2-10 shows a simplified view of online purchasing that shows C2B as well as B2B operations. The seller can provide the main catalog and also can provide the order processing, payment, and inventory control systems. If needed, the items not available at the seller can be provided by the other suppliers through their own catalogs and purchasing systems.

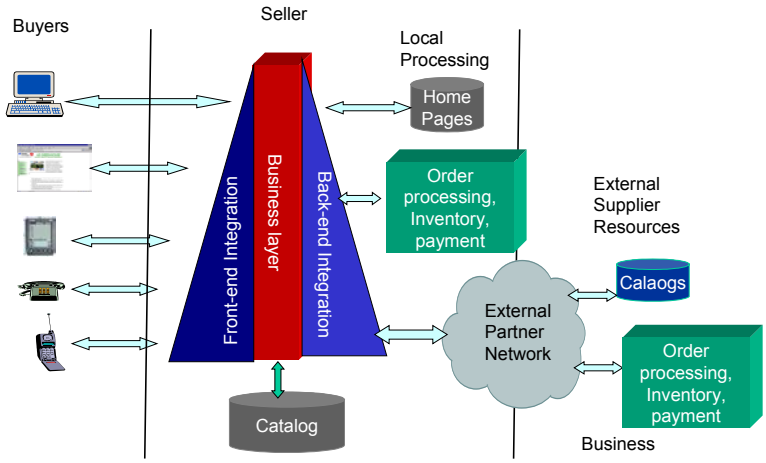

Figure 2-10: A Simple Internet-based Purchasing System

Taking the example of Bob's Bicycle Shop, the following configurations are possible:

- Bob (the seller) provides most of the products and only the backorders are placed to the external suppliers. For example, if Bob does not have enough bicycles in stock, only then are the external suppliers contacted.

- The seller provides some of the products and others are provided by external supplierss based on a pre-negotiated business agreement. For example, Bob can provide bicycles while Sam can provide shoes and other sport items but the customers do not know the difference.
- Bob is a virtual shop where he does not have any items in inventory.

Online purchasing systems, as stated previously, involve a large number of components such as Web pages, search engines, product catalogs, order processing, payment, inventory control, and shipping/receiving systems. Figure 2-11 shows the various components of an online purchasing system. These components may reside on different computers and may be built by using different technologies. In addition, all these components may need to be configured differently and will need to work together to satisfy the demands of online traders. We will discuss the technical, architectural, and integration issues related to online purchasing and EC/EB in the Platform, Architecture, and Integration Modules of this book.

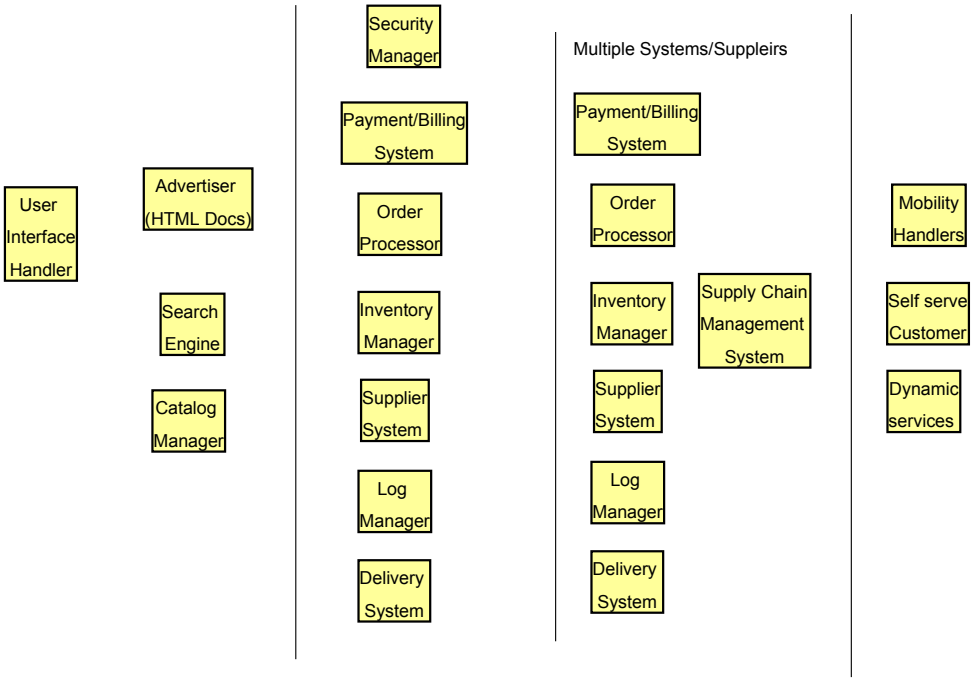

Figure 2-11: Logical Components of Online Purchasing

2.7 eProcurement and Electronic Marketplaces: The Purchasing Networks

2.7.1 Overview

eProcurement has evolved from simple purchasing systems to complex marketplaces that involve bargaining over trading networks. Any of the procurement interactions (C2B, B2B, C2C) can be conducted directly or through intermediaries. Modern enterprises are increasingly relying on different types of intermediaries. The role of intermediaries in commerce is changing as a consequence of the increasing momentum of e-commerce. In fact, it has been argued [Bakos 1997, Bailey 1997] that the role of traditional intermediaries is reduced and will eventually be eliminated with the gradual introduction of "friction-free electronic

marketplaces", in which lower costs of market transactions will make it easier to match buyers and sellers directly. However, analyses on the evolution of e-commerce strategies [Bakos 1998, Taylor 2001] suggest that, while certain types of intermediaries are indeed bound for extinction, a new role is emerging for electronic intermediaries in the new marketplace. The functions performed by these intermediaries include matching buyers and sellers, providing product information to buyers and marketing information to sellers, aggregating information, integrating the components of consumer processes, managing physical deliveries and payments, and providing trust relationships and ensuring the integrity of the markets [Wuman 2001, Bakos 1998].

Intermediaries basically match buyers and sellers to reduce transaction costs and to ease trading-relationship management. In the late 1990s, the value of Internet-based B2B transactions grew at more than 150% annually before the Internet bubble burst. These transactions are currently being executed through three primary channels:

- Web storefronts;
- Virtual shops; and
- Electronic marketplaces (eMarkets).

We have already looked at Web storefronts and virtual shops. Let us now review different aspects of eMarkets.

2.7.2 Electronic Marketplaces (EMarkets)

B2B e-commerce has been vastly accelerated by the introduction of electronic marketplaces and exchanges. Electronic marketplaces, also known as Emarkets or e-markets, bring together multiple vendors "under one roof" and provide a single point of access for brokering financial transactions and information exchange across a large community of buyers and sellers. Emarkets offer a powerful means for purchasing based on vendors, price, terms, order, payment plans, etc. The participation of multiple and diverse suppliers differentiates emarkets from Web-storefronts and virtual shops. Emarkets use catalogs, auctions and reverse auctions (i.e., a customer quotes a price he/she is willing to pay). See Figure 2-12.

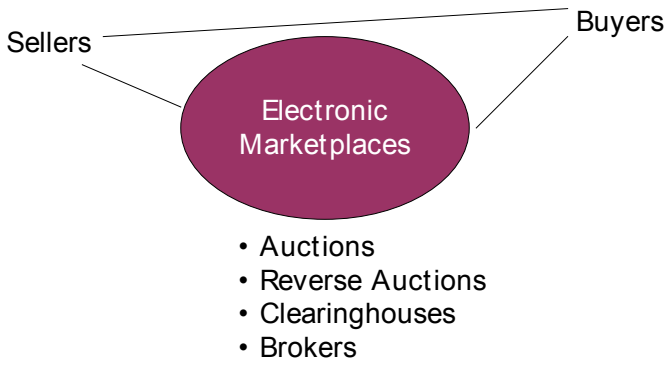

Figure 2-12: Conceptual View of Electronic Marketplaces

A very large number of emarkets (EMs) are being developed at present. According to the Aberdeen Group, 600 B2B EMs existed in April 2000, with new entrants coming online at a rate of 50 per month (since then, many have disappeared). Despite some setbacks, it is expected that many online transactions will be channeled through emarkets in this decade. Thus organizations will need to decide which emarkets to buy from, which to sell into, and which to build.

An interesting example of emarkets is Verticalnet.com which provides several marketplaces in a diverse array of segments. Huge marketplaces have been set up by Fortune 500 players such as GM, FORD, and Boeing. In the telecommunications industry, emarketplayers include: British Telecom, Deutsche Telecom,

BellSouth, SBC, and others. Examples of Telco EMs are telezoo.com, demandline.com, simplexity.com, thegtx.com, and band-x.com.

The Web sites www.bobcat.com and WWW.ontology.com have a list of many electronic marketplaces. Current EMs are beginning to consolidate a wide range of intermediaries such as the following (we will review the functions of an EM in the next section):

- *Clearing houses* that provide a common point for traders (e.g., catalog clearing houses)
- *Trading hubs* that allow customers to trade goods and services (e.g., BandX for bandwidth trading)
- *Brokerages* that provide brokers that act on your behalf (e.g., shopbots that shop on your behalf for certain items based on your needs)

In essence, the initial focus of EMs on automating financial transactions has been extended to include a transparent view of demand, production plans, and supply and capacity status to all supply-chain participants. Unlike the buyer- or seller-centric e-commerce models such as storefronts and virtual shops, EMs can be equally beneficial to all participants. For example, according to Aberdeen, EMs provide the following benefits:

- Benefits to buyers: Buyers can select suitable products/services and gain access to new market opportunities. Business buyers can automate and streamline procurement processes.
- Benefits to suppliers: Suppliers can automate order and fulfillment processes, and reduce order processing errors and costs. Businesses can also identify new sales opportunities and capture increased value for excess inventories or assets.
- Benefits to market managers: Market managers can insert themselves into buyer-supplier trading relationships to assess brokering and conduct transactions across the marketplace.

2.7.3 Electronic Marketplaces – A Closer Look

EMs, as the intermediaries, improve information sharing between buyers and sellers, helping lower the cost of logistics and promoting quick, just-in-time deliveries and reduced inventories. In doing so, they occupy a strategic position in the marketplace. The main functions of a market can be summarized as (see Figure 2-13):

- matching buyers and sellers;
- aggregation and reverse aggregation;
- facilitating the exchange of goods and services along with associated information (e.g., payments); and
- providing an institutional infrastructure, in the form of a regulatory framework, for the enforcement of common trading rules.

In the electronic marketplace, intermediaries leverage technology -- primarily, networking and database technology, to perform functions a through c (function d is traditionally the government's responsibility, and it is of less interest here).

Let us analyze the functions of the new intermediaries and mention the role of technologies in the current marketplace.

The **matching** function consists of three main steps: determining product offerings, searching, and price determination. The parameters used by buyers during the first phase include personal budget, offered price and product characteristics. In the case of services (non-tangible goods), two main dimensions are usually considered for searching: the *function* performed by the service (e.g., carry passengers on a flight from A to B, or delivering food to your home), and *how* it is performed. The latter includes objective *Quality of Service* (QoS) parameters such as reliability (how likely it is that you end up at your intended destination at the scheduled time, or that your food is actually delivered), as well as more subjective parameters, such as the friendliness of the service operators. During the first phase, customers typically navigate in the two-dimensional space of functions and quality until they "converge" onto a region of interest. Thus, one of the basic requirements of an electronic intermediary is to support the search function efficiently.

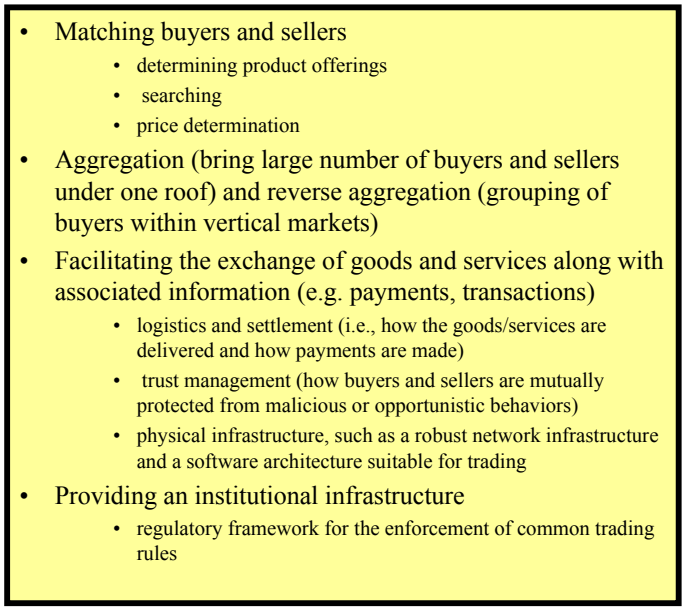

Figure 2-13: Functions of an Electronic Marketplace

The next phase consists in negotiating a price, which can be a function of many variables (market trends, demand and supply balance). In this phase, intermediaries differentiate themselves primarily by the type of price determination model they support, from personal bargaining between seller and buyer, to fixed price with predictable fluctuations, to various forms of auctioning. The main non-functional dimension for pricing support is that of *timeliness*: prices are determined at a given time and are valid only during a given time interval. It is important to guarantee that a price is determined and advertised in time, in such a way as to ensure fairness among buyers (and competing sellers), and that it is no longer used after it expires. Real-time auctioning in a distributed setting is still an area of interesting experimentation, in that it may involve the use of networking technology for the interaction of a large number of participants, with hard reliability and timing constraints (research in this area, however, is not new). See for instance [Wuman 2001, Taylor 2001, Bakos 1998].

Aggregation brings together a large number of buyers and sellers under the same virtual roof. Aggregation mainly provides easy access to many large suppliers by consumers. For example, PlasticsNet.com allows plastics processors to issue a single purchase order for hundreds of plastics products from a diverse set of suppliers. **Reverse aggregation** permits multiple buyers to group together for better consumer prices. Examples of emarkets that adopt this strategy are FOB.com, BizBuyer.com, and PurchasingCenter.com.

The next function of intermediaries is to **facilitate transactions**. Three main areas are of concern to them in this phase: *logistics* and *settlement* (i.e., how the goods/services are delivered and how payments are made), *trust management* (how buyers and sellers are mutually protected from malicious or opportunistic behaviors), and the provisioning of a *physical infrastructure*, such as a robust network infrastructure and a software architecture suitable for trading[1]. Some of these aspects are discussed in the e-commerce technical literature and also mentioned elsewhere in this report.

According to [Bakos 1998] there are two main distinctions between an electronic marketplace and its traditional counterpart: the increased *customization* and *personalization* of product offering, and the *aggregation* and *de-aggregation* of information-based product components. Two main factors enable customization: the ability to collect detailed and accurate information on individual customers (demographics as well as observed searching and purchasing behavior), and the ability to deliver

[1] The design and implementation of suitable architectures are discussed elsewhere in this document.

personalized goods (think of electronic newspapers). The relevant technology for exploiting individual information is *data mining*: techniques are being researched to perform statistical inference on large amounts of data, by aggregating it in various ways in the hope to extract reliable knowledge that can be used to make accurate predictions on future user's behavior (a detailed discussion on these techniques is beyond the scope of this survey). The production of personalized goods is also an active area of investigation, one of the main concerns being the cost of packaging a customized solution vs. the expected benefit (user's perception of the service, monetary added value, customer loyalty, etc.).

The interplay between technology and business model manifests itself clearly in the **area of customization**: data mining and individualized packaging of goods enable effective personalization, which in turn changes the parameters of the market model in such a way that sophisticated intermediaries become the crucial factor in the new marketplace. Specifically, in Bakos' analysis [Bakos 1998, Bakos 1997] the cost of goods (production, transaction and distribution, binding the bundle, price menu management) is now affected by new options for bundling/unbundling the offering, in such a way that aggregating services and products that traditionally were offered by separate industries becomes attractive. Technology reduces costs, both because digital content can be replicated and delivered more easily than traditional content, and because research in micropayment schemes are making it cost-effective for merchants to process a high volume of very small payments. Aggregation becomes a profitable strategy when marginal costs are low and the consumer target is homogeneous. Under these conditions, aggregation can occur along the *product dimension* (i.e., bundling software products with storage media, or quality food with sophisticated dining items), or along the *consumer dimension* (i.e., by offering licenses for site-wide use or through various forms of subscriptions).

2.7.4 Examples of eMarkets

A large number of EMs have emerged in different industry segments. Since these EMs change frequently, it is best to just provide the links for additional information:

- mySAP.com Marketplace (markeplace.mySAP.com) for a variety of marketplaces oriented towards the enterprise
- Marketplace for the Real Estate Industry (myimmobile.com)
- Marketplace for the Healthcare Industry (www.newforma.com)
- Marketplace for Industrial Goods (emaro.com)
- Marketplace for the Chemical and Pharmaceutical Industry (chemfarm.mySAP.com)
- International eTailing Marketplace (www.spotworld.com)
- MRO (maintenance, repair, operation) Hubs such as www.granger and www.Bizbuyer.com
- Yield managers for spot buying of supplies such as www.Employease.com, www.Adauction.com and www.Capacityweb.com
- Emarkets in the telecom industry such as telezoo.com, demandline.com, and espoke.com
- Bandwidth traders in telecommunications such as pkcomm.com, thegtx.com, and band-x.com

For more examples of emarkets, see the website www.bobcat.com.

An interesting example of emarkets is the BellSouth PurchaseWise, a business-to-business Web-based trading portal geared toward small and medium-sized businesses. This EM initially intended to offer about 25,000 items from Boise Cascade Office Products and computer manufacturer NECX. PurchaseWise later added applications supporting payroll, benefits and insurance. It also included telecom products. Another example, from the same domain, is the Portugal Telecom launching of a new business-to-business, e-commerce venture, TRADECOM, in alliance with Commerce One and Portuguese partners. A platform for the development of an emarketplace and portal for Portugal and other Portuguese-speaking countries was developed.

2.7.5 Analysis of eMarkets

eMarkets (EMs) can be cast into three categories: vertical, horizontal, and brand marketplaces.

Vertical Marketplaces. These marketplaces are focused on automating buyer-supplier interactions within a particular vertical industry, such as telecom, automotive parts, chemicals, electronic components, or retail. These EMs provide information brokering, virtual product catalogs, auctions, reverse auctions, and exchanges in vertical industry segments.

Horizontal Marketplaces. These marketplaces automate common functions that span several industries. Examples are maintenance, repair, and operations (MRO) procurement, travel management, logistics services, printing services, employee services, and benefits management. The primary focus of most horizontal marketplaces is to automate the workflow and transactions for operational business processes such as inventory control. Consequently, horizontal EMs are extensions of Enterprise Resource Planning (ERP) systems or e-Procurement systems.

Brand Marketplaces. These EMs allow a community of interest with a brand name (e.g., the Society of Manufacturing Engineers) to provide a service to its members. In this role, the market manager typically manages the buyer-seller relationship of its constituency and its trading partners.

An interesting classification of B2B marketplaces is given by [Kaplan 2000]. This classification, shown in Figure 2-14, classifies these marketplaces in terms of two dimensions. The horizontal direction shows the way customers buy materials and supplies. Broadly speaking, it can be industry specific (i.e., chemical industry versus manufacturing industry) or general materials and supplies such as books, furniture, and computing hardware/software. The vertical direction shows the method of buying (i.e., pre-agreed versus ad-hoc buying).

Figure 2-14: A classification of B2B eMarkets (Source: [Kaplan 2000])

	General Materials and Supplies (Horizontal)	Industry Specific Materials and Supplies (Vertical)
Systematic Buying (Agreed-upon Purchases)	MRO (Maintenance, Repair, Operation) ▪ Ariba ▪ www.granger ▪ Bizbuyer.com	Catalog Hubs ▪ Chemdex ▪ SciQuest.com ▪ PlasticsNet.com
Spot (ad hoc) Buying	Yield Managers ▪ Employease ▪ Addauction.com ▪ Capacityweb.com	Exchanges ▪ e-steel ▪ paperexchange.com ▪ AltraEnergy ▪ IMXExchange

2.7.6 What is the Right eMarket Strategy?

eMarkets emerged as the de facto standard for B2B e-commerce in the late 1990s. At the end of 2000, there were almost 1000 eMarkets, representing a diverse range of industries, products, services, and trading relationships. Despite the slump, eMarkets are expected to handle almost half of all online B2B transactions by the end of this decade. Companies need to make the following decisions:

- Which eMarkets to buy from
- Which to sell into (i.e., which to participate in)
- Which to build and manage on their own

Thus the e-business strategy of most organizations will have to include the eMarkets strategy. The success of a given EM may depend on several factors such as potential for profit, market fragmentation (EMs will be most successful in highly fragmented industries), need for efficiency, etc. Most consulting groups such as Gartner and Aberdeen provide technical reports in this area.

2.7.7 eMarket High Level Architectures

Many EMs at present use large consolidated catalogs that contain information from a variety of partners. The customers access these catalogs through the EM front-end and browse, select, purchase items based on some purchasing rules. In practice, however, the EMs may also directly connect with remote applications and catalogs of partners through an integration layer. Figure 2-15 shows such an architecture (note that this is a specialization of the architectural framework shown in Figure 2-2). According to this architecture, the front-end of an EM must be able to handle a multitude of users and devices while the back-end must be able to communicate with multiple trading partners. Note that XML can be (should be) used in the front-end and back-end integration. EDI is an important player in the back-end integration, with a shift from EDI to XML a future trend. The middle tier provides the content aggregation and should be component-based so that new functionalities can be added/removed easily. Platforms to support EMs are commercially available from CommerceOne and Ariba.

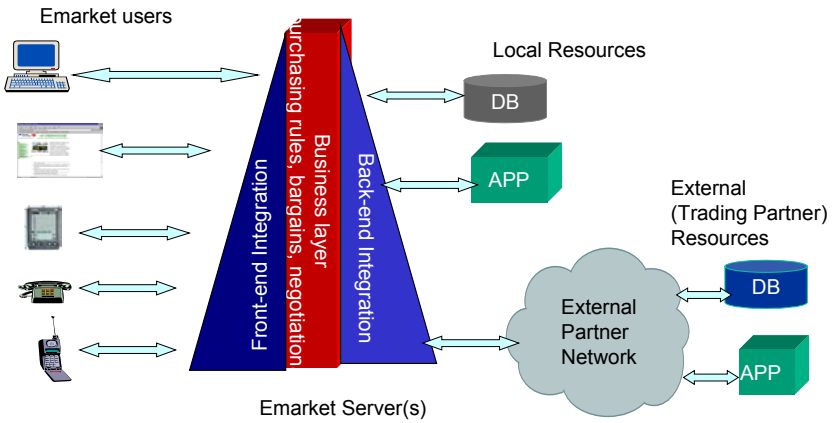

Figure 2-15: High Level Architectural View of an eMarket

2.7.8 eMarket Concluding Comments

Several eMarkets have emerged in almost all industry segments. These EMs restructure traditional buyer-supplier relationships, providing a Web-based hub for efficiently matching supply and demand, reducing transaction costs, and enhancing trading relationships. EMs do, and will increasingly, provide a single, integrated, Web-based platform for e-commerce activities and also synthesize business processes across the supply chain. EMs could also deliver web-based planning, scheduling, and collaboration services to a wide range of organizations.

Many technical issues are raised by EMs. Several standards bodies, mostly based on XML, are attempting to address these issues. In addition, several EM platforms are becoming commercially available. Examples of the EM platforms are Commerce One platform, AribaNet platform, e-Speak from Hewlett Packard, and Oracle Exchange from Oracle.

eMarket References

[1] Aberdeen Group, "The e-Business Marketplace - The Future of Competition" Executive White Paper, April 2000.

[2] Bakos, Y., "The Emerging Role of Electronic Marketplaces on the Internet", CACM, Vol. 41 No.8, August, 1998.

[3] Bakos, Y., Bailey, J., "An exploratory study of the emerging role of electronic intermediaries", International J. Electronic Commerce 1, 3, Spring 1997.

[4] Bailey, J., Brynjolfsson, E., "In search of friction-free markets: An exploratory analysis of prices for books, CDs and software sold on the Internet", In Proceedings of the 25th Telecommunications Policy Research Conference, Alexandria, VA, Sept. 1997.

[5] Delivering the Goods. Fortune, November 28, 1994.

[6] Royappa, A.V., "Implementing catalog clearinghouses with XML and XSL", Procs. 1999 ACM Symposium on Applied Computing (SAC), 1997, Langdale, Cumbria United Kingdom, Pages 616-621.

[7] Lincke, D., Schmidt, B., "Mediating Electronic Product Catalogs", CACM, vol. 41. No. 7, July 1998.

[8] Lincke, D.-M., Schmid, B. "Architecture and business potential of mediating electronic product catalogs", Proceedings of the AIS '97Conference, Indianapolis, August 1997.

[9] Lincke, D.-M., Schmid, B., and Stanoevska-Slabeva, K., "Mediating electronic product catalogs", Proceedings of the 7th Mini EUROConference, Bruges, Belgium, March 1997.

[10] Mattison, R., Killger-Mattison, B., "Web Warehousing and Knowledge Management", McGraw-Hill, 1999.

[11] Taylor, D., and Terhune, D., "Doing E-Business: Strategies for Thriving in an Electronic Marketplace", John Wiley, 2001.

[12] Wurman, P., "Dynamic Pricing in the Virtual Marketplace", IEEE Internet Computing, March-April 2001, pp. 36-42.

Web sites and Links:

CIO Magazine (www.cio.com) Case Studies on eMarkets
CommerceNet: http://www.commerce.net/
Ontology: http://www.ontology.org
CommerceOne: http://www.commerceone.com/
Managing Names and Ontologies: An XML Registry and Repository, Robin Cover, OASIS. Whitepaper, at http://www.oasis-open.org/html/registry_and_repository.html
RosettaNet: http://www.rosettanet.org/
Object Management Group, Brokerage Facility Request For Proposal OMG Document: ec/99-10-01 (www.omg.org)
OASIS - http://www.oasis-open.org/ - Web site for the OASIS: Group
http://www.westpac.com.au/emarket/index.cfm - Emarket homepage
http://www.the-emarket.com/joinindex.html - emarket.com
http://www.bobcat.com - several emarket examples
http://www.emarket.com - The eMarket Group Web site

Time to Take a Break

- ✓ Portals and CRMs
- ✓ Online Purchasing and eMarkets
- ERPs and Supply Chain Management
- Data Warehouses and Outsourcing
- Mobile Applications and M-Commerce

Suggested Review Questions Before Proceeding

- What role does online purchasing play in e-commerce?
- What are the key differences between C2B and B2B purchasing?
- What role do emarkets play in enterprises? What are different types of emarkets? Which ones have succeeded and which ones have not? Why?
- List some examples of emarkets and online purchasing systems that you have used

2.8 Enterprise Resource Planning (ERP) Systems: The Backbone of Corporate e-Business

2.8.1 Overview

ERP applications support back-office operational requirements including inventory, supply chain management, order processing, and financial reporting and management. ERP applications are a key source of functionality and information for any enterprise and are playing a major role in Internet-based procurement, supply chain management, and business-to-business (B2B) commerce.

Before proceeding, we should emphasize that ERP is not one application. Instead, ERP is used to represent a family of applications that are used to support enterprise operations. These applications are integrated around commonly shared databases.

The basic idea of ERP systems is that they provide an integrated approach to manage and operate enterprise resources such as employees, materials, and services. Traditionally, enterprise resources have been managed by a multitude of independent applications in human resources, payroll, order processing, inventory control, billing, and accounts payable/receivable systems. In some cases, companies have hundreds of applications that manage enterprise resources. For example, GTE is said to have about 1100 applications in this area. ERP systems provide a single application framework that integrates these applications together. Examples of ERP applications are SAP, BAAN, and Oracle Applications.

Although ERPs became popular in the 1990s, they have existed in principle since the 1970s. An example from manufacturing best illustrates the evolution of ERPs. The focus of manufacturing systems in the 1960s was on inventory control. Most of the software packages then (usually customized) were designed to handle inventory based on traditional inventory concepts. In the 1970s the focus shifted to MRP (Material Requirement Planning) systems which tied inventories to materials planning (i.e., the material suppliers were connected to the inventory systems to keep inventories at acceptable levels). In the 1980s, the concept of MRP-II (Manufacturing Resources Planning) evolved which extended MRP to shop floor and distribution management activities (i.e., the inventories were also connected to shop floor systems and distribution channels to take advantage of quantity discounts and fulfill just in time inventories). In the early 1990s, MRP-II was further extended to cover areas like Engineering, Finance, Human Resources, Projects Management, etc., i.e., the complete gamut of activities associated with all enterprise resources. Hence, the term ERP (Enterprise Resource Planning) was coined.

ERPs are playing an important role in the current EB, especially as players in a supply chain of trading partners. For example, the ERP of a manufacturer must interact, directly or indirectly, with the ERP systems

of material suppliers and distributors in a supply chain. Extensive discussion of ERPs is beyond the scope of this book. Key features are highlighted for the sake of completeness.

2.8.2 Classes of ERP Systems

ERP systems can be categorized in terms of the enterprise resources they manage (see Figure 2-16). The core ERPs manage the core resources that are common to all organizations. Examples of these resources are people, costs and assets (e.g., buildings, furniture, etc.). Several ERP systems are designed to manage these resources. For example, the ERPs from Peoplesoft started with human resource management by introducing the HR (Human Resource) package. At present, Peoplesoft also has ERPs for cost and asset management. Other ERPs, such as Oracle Financials from Oracle, concentrate on cost and asset management.

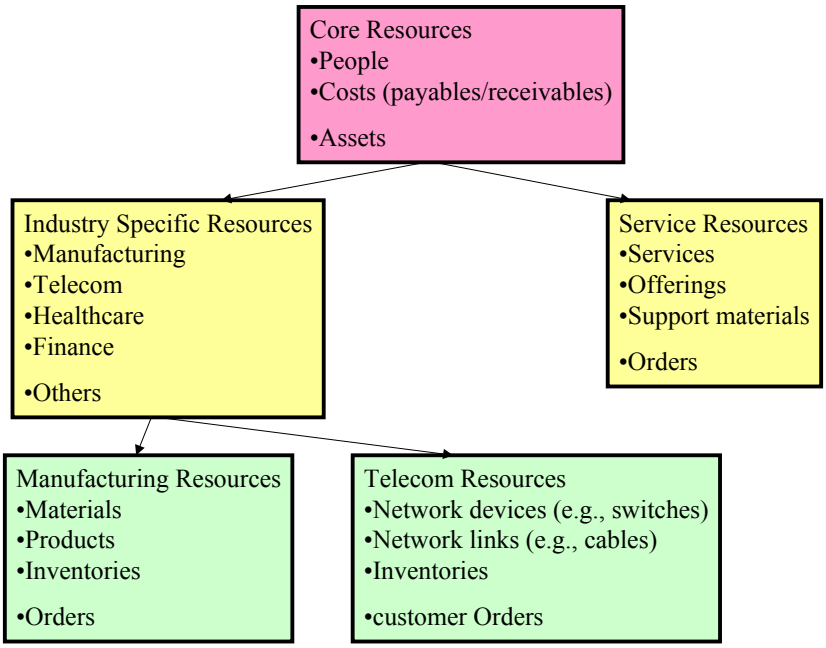

Figure 2-16: Conceptual View of ERP Systems

In addition to core resources, many ERPs concentrate on managing resources in specific industry segments (i.e., vertical markets). The oldest examples of ERPs in this segment are the ones that manage manufacturing resources such as materials, finished goods, bill of materials (i.e., the materials used in building a finished product), and inventories. These ERPs also integrate order processing applications with manufacturing materials and inventory management systems for integrated operations. SAP has developed an extensive suite of ERP applications for manufacturing. Other vendors such as BAAN also provide ERPs for manufacturing resources. Another vertical area of ERPs is the ERPs in the telecom market that manage telecom resources. These ERPs are known as Operation Support Systems (OSSs) in the telecom marketplace. At present, many OSSs are homegrown and developed by the telcos. However, established ERP vendors such as SAP are also beginning to provide OSSs.

In addition to vertical markets, ERPs are also beginning to appear for service oriented industries such as restaurants and hotels. These ERPs, being offered by large ERP vendors such as SAP, Oracle, Peoplesoft, and BAAN, are concentrating on growing service oriented industries.

In general, the current trend in ERPs is to manage *all* enterprise resources that include the core, vertical, and service resources in an integrated manner.

2.8.3 Requirements of ERP Systems

A seamless integration across a multitude of applications that participate in an "ERP supply chain" is essential to provide visibility and consistency across the enterprise. This is the main reason why ERP systems were early adopters of client/server and distributed architecture technologies. In fact the major reason for the success of SAP, a major ERP vendor, is that it consolidated multiple applications under a single technology umbrella.

The efficiency of an enterprise depends on the quick flow of information across the complete supply chain, i.e., from the customer to manufacturers to supplier. This places demands on the ERP system to have rich functionality across all areas like planning, engineering, production, inventory management, marketing, purchasing, accounts receivable/payable, quality management, distribution planning and external transportation. EDI (Electronic Data Interchange) has been an important tool in speeding up communications with trading partners. However, more attention is currently being paid to XML in ERPs.

As companies become global and decentralize their business, ERP systems need to have extensive multi-site management capabilities. The complete financial accounting and management accounting requirements of the organization should be addressed. It is necessary to have centralized or de-centralized accounting functions with complete flexibility to consolidate corporate information.

ERP systems should be supported/augmented by a strong EIS (Enterprise Information System) with extensive drill down capabilities for the top management to get a high level view of the their organization and to help them to analyze performance in key areas.

2.8.4 Evaluation Criteria

ERP systems are large scale expensive software packages. At present, many companies provide ERP as an Application Service Provider (ASP) so that the customers do not have to purchase and install their own ERPs. This outsourcing of ERPs is supported by several groups. See, for example, the Web site for ERP Outsourcing Forum (http://www.outsourcing-erp.com).

If you have to choose your own ERP, the following important points should be kept in mind while evaluating ERP software:

- Fit with the Company's business processes
- Degree of integration between the various components of the ERP system
- Technology such as the use of Web for user access, object-orientation for re-use, and XML for information exchange
- Security support for privacy and integrity of information
- Ability to support multi-site planning and control
- Availability of regular upgrades
- Amount of customization required
- Flexibility and scalability
- User friendliness to hide the internal complexity
- Quick implementation; shortened Return on Investment (ROI) period
- Local support infrastructure
- Availability of reference sites
- Total costs, including cost of license, training, implementation, maintenance, customization and hardware requirements

After selection of the right ERP system, the ERP system needs to be installed. The success of an ERP solution depends on how quickly the benefits can be reaped from it. This necessitates rapid implementations which lead to shortened ROI periods. Some ERP vendors conduct a concurrent Business Process Re-engineering during the ERP implementation and aim to shorten the total implementation time frame (this was a common BAAN practice). The approach may involve a comprehensive implementation scenario where the focus is more on business improvement than on technical improvement during the

implementation. This approach is suitable when improvements in business processes are required. Alternatively, a compact implementation scenario can be adopted with the focus on technical migration during the implementation with enhanced business improvements coming at a later stage. This approach is suitable when improvements in business processes are not required immediately.

2.8.5 Future Trends in ERP

Most ERP systems were developed before the onslaught of EC/EB. Naturally, the ERP systems have gone through a "face lifting" and have enhanced their products to become "Internet Enabled" so that customers worldwide can have direct access to the supplier's ERP system. ERP systems are also embedding the Workflow Management functionally to provide a mechanism to manage and control the flow of work by monitoring logistic aspects like workload, capacity, throughput times, work queue lengths and processing times.

Recognizing the need to go beyond the MRP-II and ERP, the vendors are busy adding to their product portfolio. One area of work is to extend ERPs to support B2B trade. For example, MySAP from SAP is an eMarketplace for B2B users. Other features also have been added. BAAN, for example, introduced concepts like IRP (Intelligence Resource Planning), MRP-III (Money Resources Planning) and acquired companies for strategic technologies like Visual Product configuration, Product Data Management and Finite Scheduling.

ERP References

Norris, G., et al, "E-Business and ERP: Transforming the Enterprise", John Wiley, May 2000.

Information Systems Frontiers Journal, Special Issue on ERPs, Kluwer, 2001.

Shtub, A., "Enterprise Resource Planning (ERP): The Dynamics of Operations Management", Kluwer Academic Publisher, March 1999.

Ptak, C. A., Schragenheim, Eli, (Editor), "ERP Tools, Techniques and Applications for Integrating the Supply Chain", St. Lucie Press, Sept. 1999.

Clott, J., Raff, S., "Peoplesoft Application Development Tools", McGraw Hill, September 1999.

Buck-Emden, R., Weinland, A., (Translator), "SAP R/3 System®: An Introduction to ERP and Business Software Technology", Addison-Wesley, Sept. 1999.

Communications of ACM, special issue on ERPs (April 2000).

First International Workshop on ERP, Venice, Nov. 1999.

ERP Outsourcing Forum (http://www.outsourcing-erp.com).

www.sap.com - SAP Web site with many white papers and tutorials on SAP and ERP.

www.baan.com - Baan Web site with links to many sources of information.

2.9 Supply Chain Management Systems: the Backbone of B2B e-Business

2.9.1 Overview

A *supply chain* is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. Suppliers, distributors, manufacturers, and resellers play different roles in supply chains (see Figure 2-17). Supply chains exist in both service and manufacturing organizations. Naturally, the complexity of the chain may vary greatly from industry to industry and firm to firm. For example, the supply chain for a small vegetable store may be very simple (buy the vegetables from farmers directly and sell them) but may be long and complex for a national food store. In large scale manufacturing industries, the supply chain may involve dozens and even hundreds of partners.

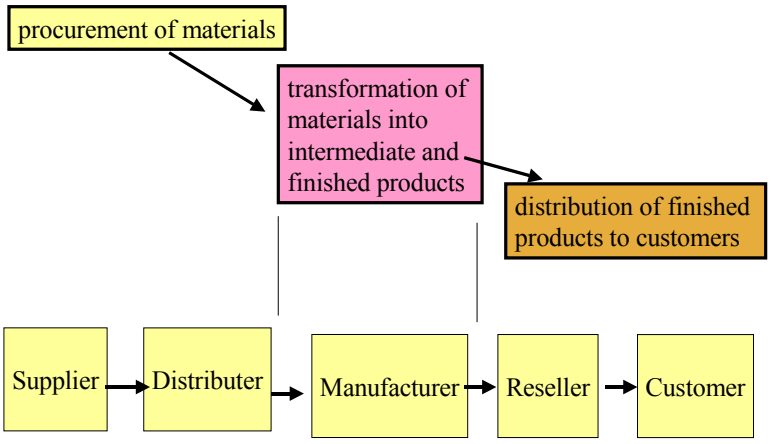

Figure 2-17: Conceptual View of Supply Chains

A key problem in supply chains is that marketing, distribution, planning, manufacturing, and purchasing from different organizations have to work together. Many organizations in a supply chain have their own objectives and these are often conflicting. Supply chain management is a strategy through which different functions along the supply chain can be integrated. The purpose of supply chain management (SCM) is to coordinate the activities of various players in the chain. According to Cooper and Ellram [1993], a supply chain management is a well-balanced and well-practiced relay team. Such a team is more competitive when each player knows how to be positioned for the hand-off. The relationships are the strongest between players who directly pass the baton, but the entire team needs to make a coordinated effort to win the race.

Supply chains and supply chain management approaches have been around for centuries. Over the years a large body of research and know-how in supply chains has been accumulated and can be found in several text books and magazines (see the sidebar on "Supply Chain Management References " for a small subset). Detailed discussion of SCMs is far beyond the scope of this book. We quickly give some background information about supply chain decisions and models and then concentrate on how the Internet and e-business are fundamentally changing supply chains.

2.9.2 Supply Chain Decisions and Models

In a supply chain, a large number of decisions are made at strategic (i.e., for longer time horizon) and operational (i.e., day-to-day shorter time horizon) levels. The following major decision areas in supply chain management occur both at strategic and operational levels [Ganeshan 1995]:

- **Location Decisions** that determine the location of purchasing, manufacturing and distribution facilities. Although location decisions are primarily strategic, they also have implications on an operational level.
- **Production Decisions** include what products to produce, and which plants to produce them in. These decisions also include allocation of suppliers to plants, plants to distribution centers (DCs), and DCs to customer markets.
- **Purchase Decisions** that include what to buy, where to buy it from, and how to transport the purchased items to DCs and final centers.
- **Inventory Decisions** refer to means by which inventories are managed to buffer against any uncertainty that might exist in the supply chain (i.e., keep inventory of items in case some materials do not arrive in time).
- **Transportation Decisions** that determine how the items are transported around the supply chain. These decisions are closely linked to the inventory decisions, since there is a tradeoff between inventory cost and transportation cost (you can keep large inventories to minimize transporting items on an as needed basis).

These decisions, as stated previously, can be at strategic and operational levels and require different types of information models. The information models show the players in the supply chain and what information they consume/produce throughout the supply chain. The models for strategic decisions are typically large and require a considerable amount of information because strategic decisions try to integrate various aspects of the supply chain. Often, due to the enormity of information requirements, strategic information models provide approximate solutions to the decisions they describe. The operational decisions, meanwhile, address the day-to-day operation of the supply chain. Due to their narrow perspective, these models often contain a considerable amount of detail and provide very good, if not optimal, solutions to the operational decisions.

In addition to strategic and operational level decisions, some intermediate level decisions may also need to be made in practice.

These decisions and information models, as we will see, are being greatly influenced by the Internet Economy and E-business. For a more detailed discussion of design aspects of supply chains, the reader should review available text books in this area (e.g., “Introduction to Supply Chain Management”, by *Handfield and Nichols,* Prentice Hall; 1998; and "Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies", by Simchi-Levi, and Kaminsky, Irwin/McGraw-Hill, 1999).

2.9.3 “Electronification” of Supply Chain Management (“eSCM”)

It is important to establish a technology strategy for SCM that supports multiple levels of decision making and gives a clear view of the flow of products, services, and information. An information technology system is needed that integrates capabilities at three levels:

- For operational decisions, the system must be able to handle day-to-day transactions and e-commerce across the supply chain and provide instant information on orders and daily scheduling.
- For mid-term decisions, the system must facilitate planning and decision making, supporting the demand and shipment planning and master production scheduling needed to allocate resources efficiently.
- For strategic value, the system must provide tools, such as an integrated supply chain network model, that synthesize data for use in high-level "what-if" scenario planning to help managers evaluate plants, distribution centers, suppliers, and third-party service alternatives.

Unfortunately, the information that most companies require urgently to enhance supply chain management resides outside of their own systems. This is precisely where the Internet is playing a major role. Internet connectivity creates opportunities to change the supply chain fundamentally. But Internet is not the only player in "eSCM". The following technologies are changing the SCM landscape (we will cover these technologies in other modules of this book):

- Internet by providing direct links between supply chain players around the globe
- Web and XML by providing access and interchange between supply chain players
- EDI for handling orders between large companies (EDI is an older technology but still used heavily in SCM)
- ERPs (Enterprise Resource Planning) systems that provide access to resources throughout an organization
- Enterprise application integration (EAI) platforms that make it easy for companies to integrate with a diverse array of suppliers, resellers, manufacturers, and customers

Collectively, these technologies are changing the existing/old model of SCM to the new model where the suppliers communicate with the consumers in fewer steps (see Figure 2-18). See the next section for some examples.

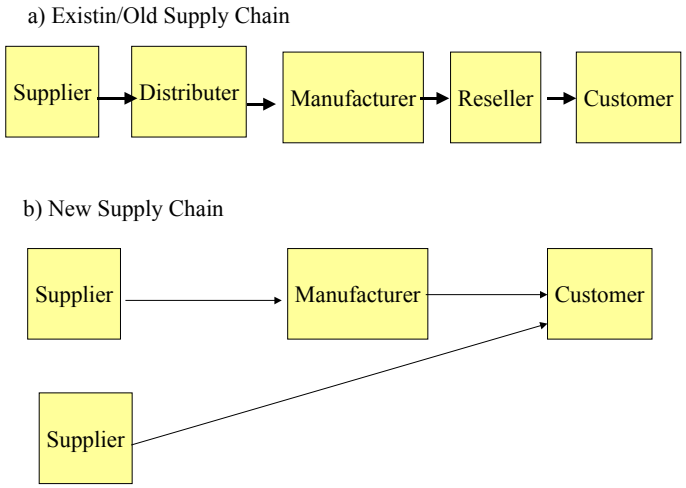

Figure 2-18: Old Versus new Models of Supply Chain

2.9.4 Illustrative Examples of Modern Supply Chains

There are several successful examples of multi-national corporations that reap benefits and maintain their competitive edge due to efficient SCMs. Some representatives of industry practitioners include Procter & Gamble, Wal-Mart, Coca-Cola, Hewlett Packard, Cisco, IBM, Sun Micro Systems, Compaq Computers, DELL and 3COM. According to Anderson Consulting there were at least 60 products and solution providers circa 2000 [http://www.ac.com/services/scm/scm_thought_ASCET_Editorial_Board.html]. Some of the key product vendors include i2 Technologies, BEA Software, Manugistics, Persistence Software, Oracle, SAP, Sybase, Agile Software Inc., Calico Commerce, Veritas Software, Descartes Systems Group, QAD Inc., Summit Technologies, RBA Associates, SNS Supply Chain Management, HK Systems Inc.,and Sun Micro Systems. There are several consulting organizations that are engaged in SCM solutions: JD Edwards, Anderson Consulting, Radient Systems, ABC Technologies, SYNTRA Corporation, Yantra Corporation, TransView Corporation, Candle Corporation, and IDS Scheer. There are more than 200 fortune 500 companies that have SCM. The market for SCM keeps growing due to mergers among corporations, new e-commerce virtual enterprises, change/expansion in company focus, new customer demands and global competition.

An example of supply chain management is Procter & Gamble (P&G) that introduced the Streamlined Logistics program to improve customer service and supply chain efficiency. The first phase consolidated

ordering, receipt, and invoicing of multiple brands, harmonized payment terms, and reduced bracket pricing categories. For the customers, this implied that they could mix a load of soap or paper or food products on a full truck to get the best possible pricing. They could also take advantage of common-quantity pricing brackets across all product lines. To ensure customer satisfaction, P&G instituted a scorecard to enable both distributors and vendors to evaluate P&G's efficiency in such key areas as category management, assortment, efficient product introduction, promotion, and replenishment. P&G also has undertaken Streamlined Logistics II to reduce unloading time in food-retailer warehouses. By combining such tools as activity-based costing and Electronic Data Interchange (EDI) with drop-and-hook programs and elimination of pallet exchanges, P&G expects to remove non-value-added costs and improve consumer value -- in the process saving $50 million. (Source: Aberdeen Group Report on Supply Chains, Feb. 2000).

Several interesting examples of how supply chains are working at global level (i.e., companies in the Far East are working with companies in the US as part of a supply chain) by using a mixture of EDI and XML technologies are given by [Chabrow 2000]. A specific example is the Lucent Technologies Microelectronics Group supply chain system that could deliver silicon chips halfway around the world in 2 days. This SCM was developed in collaboration with DHL – a global shipping company. Another example is the Stride Rite Corp., a $573 million retailer of athletic and casual footware. This SCM cut by a third (from 60 days to 19 days) the time it takes to ship shoes from Asia to its distribution center in Louisiana, Kentucky. The retailer also cut its transportation cost by 30% and inventory turnaround time by 25%. Thus less money is tied up in inventory and is freed up for other purposes. This was accomplished by using an Internet-based package that uses XML instead of EDI for overseas dealers. This supply chain management system keeps track of shipments and assembly operations from China to the warehouse in Lexington, Massachussets. The main characteristics of these global supply chain systems are:

- Web-based viewing and manipulation of information at all stages in the supply chain
- Heavy use of EDI technology between established large scale trading partners
- Use of XML to exchange data between less technologically sophisticated overseas partners that lack the resources to handle EDI

2.9.5 Selling Chain Management

Selling chain management concentrates on a different type of chain - the sales chain. Due to the advent of e-business, many new sales channels are now available to enterprises. Increasingly, selling chain management software is needed to automate direct and indirect sales. "Selling chains" can be formed around multiple sales channels for different products. For example, Dell sells its computers through Web interfaces, telephones, or Dell authorized stores. Selling chain management software can present a uniform view that allows an organization to understand, diagnose, and correct problems in multiple sales channels. For example, Dell would need to understand which sales channels are most profitable and why. The main idea of selling chain management software is to help companies sell better across all sales channels. Many selling chain management systems manage customer orders and are thus customer facing as compared to supply chain management systems that are supplier facing. These two chain management systems work on the front-end and back-end systems, respectively and complement each other. For a detailed discussion of selling chain management, see [Kalakota 2001, Chapter 7].

2.9.6 Trends in SCM

Supply Chain Management (SCM) is an enterprise wide infrastructure for managing networks of facilities and distribution options such as procurement of materials, transformation of these materials into intermediate and finished products, and distribution of finished products to customers. Supply chains exist in both manufacturing and service organizations. Complexity of a supply chain may vary from industry to industry and from firm to firm. In a typical manufacturing industry, the supply chain will integrate suppliers of raw or semi-finished goods, inventory of intermediate storage, distribution of material, and all other related activities in its suppliers to end-product pipeline. Similarly, in a service-oriented organization, the supply chain management provides a smooth interface among various vendors, warehouses, inventory management,

customer order processing and delivery, and end users. Thus, SCM can be viewed as a system of information, communications and computing infrastructure that provides a reliable interface among participating subsystems to realize efficient workflow among all participating entities.

The following trends in SCM are worth noting (see Figure 2-19):

- Although the origin of SCM is manufacturing, the notion of SCM is becoming quite popular in service industries such as airlines, healthcare, and telecommunications.
- Time lag among constituent subsystems is being eliminated as much as possible. With the advent of consumer centric e-commerce enterprises and a competitive global business environment, leading companies now recognize that their SCM should function very efficiently to meet customer demands. Hence, the notion of "zero latency", also known as real-time, supply chain management has become one of the very basic requirements of modern SCM systems.
- In addition to zero latency, supply chains are also being designed as "active" systems where a disruption in the supply chain is not only noticed but also adjusted to by using alternate paths. For example, if a particular supplier is causing the delay, then the system can consider alternates such as electronic marketplaces to supply the needed items.

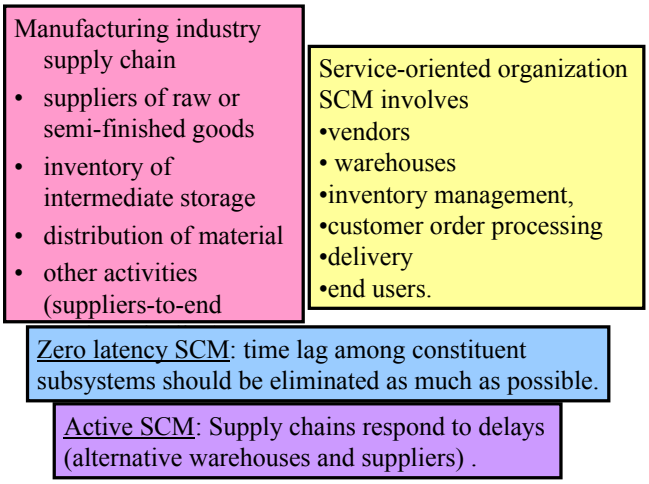

Figure 2-19: Supply Chains Evolving to Zero Latency ("Real-Time") and Active SCM

Supply Chain References

"Web-based Supply Chain Management", Tan, G, et al, Information Systems Frontiers, Jan 2000, pp. 41-56.

"Introduction to Supply Chain Management", Handfield, R. B., Nichols, E. L. Jr., Prentice Hall; July 1998 .

"Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies", by Simchi-Levi, and Kaminsky, McGraw-Hill, 1999.

Information Systems Frontiers Journal, Special Issue on Supply Chain Management, Kluwer, 2001.

"Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service)", Martin, C., Financial Times Management; 2nd edition (April 1999) , ISBN: 0273630490.

"Advanced Supply Chain Management: How to Build a Sustained Competition", Poirier, C. C., Publishers' Group West; February 1999, ISBN: 1576750523.

"Business Logistics Management", Ballou, R. H., Prentice Hall, Englewood Cliffs, NJ, Third Edition, 1992.

For research papers in this area, "Supply Chain Management Review" from Cahners Publishing Co. is a good source.

An introduction to SCM – http://silmaril.smeal.psu.edu/misc/supply_chain_intro.html.

For a basic definition and overview -- http://www.ascet.com/ascet/wp/wpHakanson.html.

Collection of white papers on SCM by industry participants and solution providers by Anderson Consulting - http://www.ac.com/services/scm/scm_thought_ASCET_Editorial_Board.html, http://www.ascet.com/ascet/docs/wpTOC.html.

An overview of SCM and various activities at Supply-Chain Council – http://www.supply-chain.org.

A collection of case studies -- http://www.ascet.com/ascet/cs/index.html.

A collection of solution providers (60) -- http://www.ascet.com/ascet/docs/spTOC.html.

Sprint's ION as an infrasctructure solution for SCM http://www.ascet.com/ascet/sp/spSprint.html.

Global Supply Chain Management – http://www.globalsupplychain.com.

Supply Chain Management: Journal Overview – http://www.mcb.co.uk/scm.htm.

Time to Take a Break

- ✓ Portals and CRMs
- ✓ Online Purchasing and eMarkets
- ✓ ERPs and Supply Chain Management
- Data Warehouses and Outsourcing
- Mobile Applications and M-Commerce

Suggested Review Questions Before Proceeding

- Why are ERPs important for organizations? What specific problems do they address?
- What are the future trends in ERPs and why should these trends be of interest to organizations?
- Why are SCMs important for organizations? What specific problems do they address?
- What are the variants of supply chain management systems and where can they be used?
- List some examples of ERP and SCM systems that you are familiar with.

2.10 Data Warehouses, Data Mining, and Business Intelligence

2.10.1 Overview

Many e-business applications require the consumers to directly interact with the databases for business intelligence. An example is a corporate data warehouse that is used to support business intelligence through data mining and other processes. A data warehouse is a repository of information (data) for decision support.

The notion of a data warehouse was first introduced by Barry Devlin and Paul Murphy [Devlin 1986] with statements such as the following:

"To ease access to the data …., it is vital that all the data reside in a single logical repository, the Business Data Warehouse".

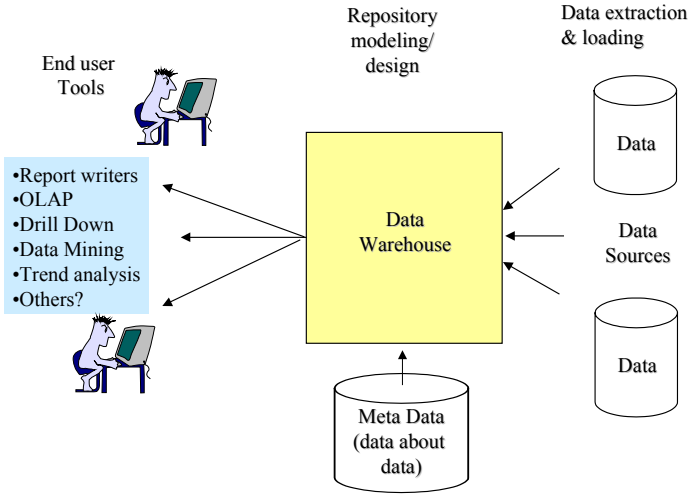

Figure 2-20: C2D Pattern - Data Warehousing

This concept was commercialized by IBM as "Information Warehouse" in 1991 and the term "Data Warehouse" was popularized by Bill Inmon [Inmon 1993] to emphasize the separation of ***operational data*** (the data that is used for daily transaction processing) from ***informational data*** (data used primarily by decision support users such as executives, analysts, and line managers). Data warehouses are developed primarily for decision support systems (DSS) rather than the traditional on-line-transaction processing (OLTP) systems that are at the core of ERP systems. Figure 2-20 shows a conceptual view of a data warehouse. Such systems have been established in many organizations to provide access to operational data by creating a repository for decision support. Data mining tools play a key role in data warehousing because they exploit a combination of AI and statistical analysis techniques to discover information that is hidden or not apparent through typical query and analysis tools. The availability of massive amounts of corporate data in data warehouses that is widely accessible by authorized Web users has provided a rich field for data mining and business intelligence. A brief review of data warehouses and data mining is given here. Chapter 3 of the Integration Module discusses this topic in great detail.

2.10.2 Highlights of Data Warehouses

The basic components of a data warehouse are a comprehensive database that contains information to support corporate decisions, data sources that are used to populate the database, meta data (data about data) that defines the informational data contained in the warehouse in user and/or business terms, and decision support tools (e.g., report writers, spreadsheets, "drill down" applications, data mining tools) to access and analyze the data warehouse. Extract programs are used to load the data warehouse.

A large number of data warehouses (DWs) have been developed since the early 1990s. These include DWs for banking, healthcare, aerospace, retailing, manufacturing, telecom, and almost all other industry sectors. These DWs have been used to gain business intelligence such as the following:

- What was the best month for radio sales?
- Which doctors filed the largest number of claims during the last year?
- How many vacations do the employees in my company take per year?
- How many VISA card holders from our bank did not use their VISA card last year?
- Which doctors in New York charge more than the national average for plastic surgery?

- How many purchase orders were placed in the last three years for VCRs?
- Which products stay in the inventory the longest?
- Which store is most profitable compared to the rest in the chain?

The centralized data warehouse approach, shown in Figure 2-21, is the most common approach to building a data warehouse. This approach, popularized by IBM's "Information Warehouse", advocates a large centralized warehouse database that adheres to a single, consistent enterprise data model. All operational and external data is copied and stored in the central data warehouse. The central warehouse may be used to populate individual data marts for improved performance and ease of access.

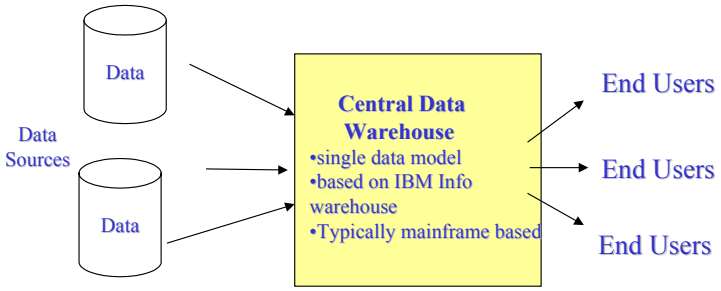

Figure 2-21: Centralized Data Warehouse

Another common approach is the localized data warehouses, also known as the "data marts', shown in Figure 2-22. Data marts are typically created by individual departments or divisions to support their own decision support activities These data marts may be created to support specific products (e.g., automobile parts) or function (e.g., loan management) of individual departments, divisions or regions. In some cases, data marts may be created for user populations with the same technical environments. For example, separate data warehouses for PC users, for UNIX users, and for MVS users could be created.

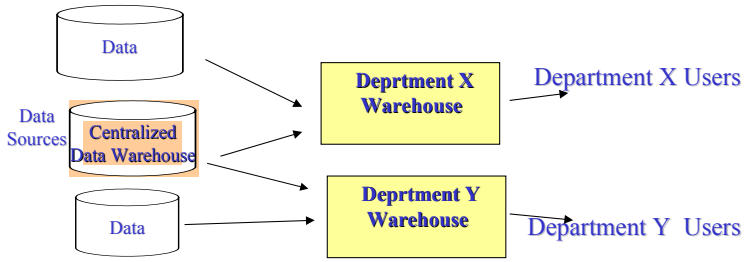

Figure 2-22: Localized Data Warehouses (The Data Marts)

2.10.3 Data Mining and Web Mining

Data mining tools exploit a combination of AI and statistical analysis to discover information that is hidden or not apparent through typical query and analysis tools. Specifically, the data mining tools use a variety of underlying technologies such as neural networks, decision trees, statistical analysis, and machine learning to detect:

- Associations (e.g., linking purchase of pizzas with beer);
- Sequences (e.g., tying events together such as marriage and purchase of furniture);
- Classifications (e.g., recognize patterns such as the attributes of customers who will discontinue doing business with you); and
- Forecasting (e.g., predicting future buying habits of customers based on past patterns).

Data mining has become a major growth area for data warehouses, especially for customer relationship management (CRM). Although the basic mining algorithms have been around for several years, the availability of massive amounts of corporate data in data warehouses has provided a rich field for these tools to mine. In particular, corporations can mine DWs to discover patterns of sales, customer buying habits, lifetime value (LTV) of customers, new customers likely to buy new products, demands on inventory, correlations between opening new stores and product sales, etc. For example, many data mining efforts have been devoted to understanding the customer behavior to retain customers, acquire customers, upsell (i.e., sell more expensive products) and cross sell (sell related products). Data mining has also been used in direct mail (i.e., determine who is most likely to buy from direct mail), crime prevention (i.e., where crimes are most likely to happen), fraud detection (i.e., which insurance claims and credit card transactions are likely to be fraudulent), trend analysis (i.e., predict changes in customer behavior), and financial forecasts (i.e., models of stock markets).

Web mining has gained popularity due to the widespread use of Web sites. The basic idea is to mine the Web sites, in particular, the behavior of the users who visit the Web sites. The customer requests, as captured in ***"clickstreams"*** (the log of users clicking for different Web pages) are being used regularly for content personalization of Web sites. For example, if you visit a Web site, view several pages, and then purchase an item, then your clickstreams will show a trace of all the pages you visited before you finally purchased something. These clickstreams can later be mined to understand how users purchase items.The main objectives of Web mining are:

- Look for e-commerce events associated with a single user during a single visit to determine what the user does during a visit.
- Look for and differentiate between product events (i.e., which particular products are being reviewed) and visit events (i.e., how long the user visited the Web site).
- Develop personalization that facilitates conversion of browsers to buyers, i.e., take full advantage of e-commerce Web site personalization.

A successful Web mining application will capture the behavior of site visitors and discover patterns that will help you design better and more profitable Web sites. The general objective is to identify and characterize data structures meaningful in e-commerce terms.

Data Warehousing and Data Mining Sources of Information

- Faulkner Information Services, "Business Intelligence Solutions Market trends", 2001.
- “Web Warehousing and Knowledge Management”, by Mattison, R., Killger-Mattison, B., McGraw-Hill, 1999.
- Groth, R., “Data Mining: Building Competitive Advantage”, Prentice Hall, 2000.
- Devlin, B., “Data Warehouse: from Architecture to Implementation”, Addison Wesley, 1997.
- "Data Warehousing and Data Mining: Implementing Strategic Knowledge Management" by Elliot King, computer technology research.
- "Building Data Mining Applications for CRM" by Berson, A., et al, 1999.
- "The Data Warehouse Lifecycle Toolkit: Expert Methods for Designing, Developing, and Deploying Data Warehouses" by Ralph Kimball.
- "The Data Webhouse Toolkit : Building the Web-Enabled Data Warehouse" by Kimball, R., Merz, R.
- "Data Mining: Practical Machine Learning Tools and Techniques with Java Implementations" by Ian H. Witten, Eibe Fran.
- "Advances in Knowledge Discovery and Data Mining" by Fayyad, U. M., (Editor), et al.
- "Building the Data Warehouse" by William H. Inmon.
- "Building the Operational Data Store" by William H. Inmon.
- "Building, Using, and Managing the Data Warehouse" by Herbert A. Edelstein (Editor), et al.
- "Business Intelligence: The IBM Solution" by Mark Whitehorn, Mary Whitehorn (1999).

2.11 Outsourcing Through Service Providers (NSPs, ISPs, ASPs)

2.11.1 Overview

Simply stated, a service provider offers you a set of services based on an agreed upon contract. The services can be business services such as physical site security or technical such as Web hosting. Different service provider models, centered around the Internet, are becoming popular to facilitate outsourcing. For example, businesses and consumers can rent services from service providers such as the following (see Figure 2-23):

- *Network Service Providers (NSPs)* that provide the network "pipe" (end to end network communication and routing services) for E-business. Examples of NSPs are the telecommunications companies that include a variety of local exchange carriers and long distance carriers.
- *Internet Service Providers (ISPs)* that support Web services and provide access to the public Internet. America Online is a well known example of ISPs.
- *Platform Service Providers (PSPs)* that provide the platform services (computing hardware, operating systems, basic middleware) needed to support e-commerce or other applications for buying and selling over the network. PSPs, in essence, are similar to the old "computing centers" that provided the computing hardware/software for business applications. Due to the emphasis on e-commerce, PSPs are also referred to as CSPs (commerce service providers). Examples of PSP/CSPs are Rightworks.com, CommerceOne, and Ariba.net.
- *Application Service Providers (ASPs)* host application components (mostly business aware) that clients use over a wide area network. A very wide range of ASPs have emerged in recent years with services that range from payroll to inventory control. For example, major software vendors such as SAP, Oracle, and Peoplesoft are becoming ASPs. We will discuss ASPS in more detail later.
- *Business Service Providers (BSPs)* that provide business services such as mail delivery, customer support, and building security.

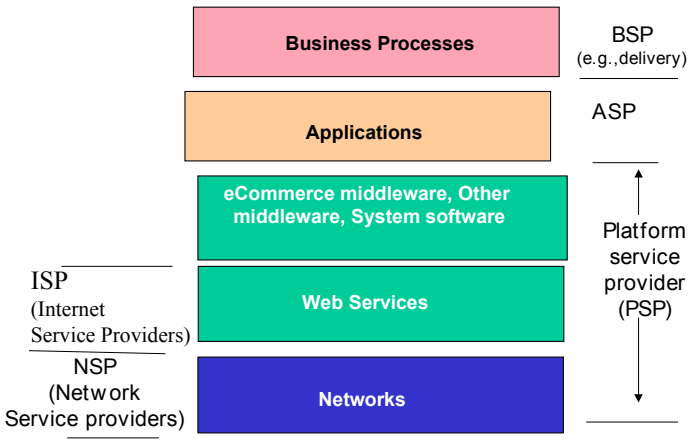

Figure 2-23: Types of Service Providers

2.11.2 Outsourcing Through Service Providers

Outsourcing, i.e., hiring someone else to do a job on your behalf, has been an attractive business practice for several years. Service providers (SPs) in the Internet economy (e.g., NSPs, ISPs, PSPs, and ASPs) are making it possible for companies to outsource many of their services. It is theoretically possible for a newly formed company to outsource *everything* by using a variety of service providers. That is the essence of

virtual enterprises – they rely exclusively on outsourcing. In particular, the role of application service providers (ASPs) is of particular importance to E-business outsourcing. A large number of ASPs became available in the late 1990s. According to an Aberdeen group report, a dozen new ASPs per month became available in 1999 -- more than 2000 in 18 months.

Cost and time savings are the two basic drivers for outsourcing through SPs. Figure 2-24 shows the basic cost motivation. Let us take the example of a start-up software company to illustrate the basic idea. This company needs to use a variety of applications such as payroll, inventory, purchasing, order processing, etc. to get started. Buying, installing, and running these applications and the underlying platforms would require an up-front cost even when there are very few customers (or none). Outsourcing, i.e., renting these applications from an SP can be much more economical on a per usage basis. However, as the customer base grows, the cost of renting may exceed the cost of owning as shown in Figure 2-24. In addition to cost savings, time savings can be a big factor in outsourcing – you can use services more quickly from a service provider than by struggling through your own purchase, acquisition, and install cycle. According to the ASP Forum (www.aspforum.com), building your own infrastructure requires a minimum of 8 months to a year for a small company while it can be done in a matter of weeks by using SPs. For example, ASPs like Corio can support a new customer in 4 to 14 weeks for large applications that may require several months to purchase and set up. According to the ASP forum, customers can also save from 30% to 40% by using an ASP model. More information about different aspects of outsourcing can be found at the site (www.outsourcing-research.com).

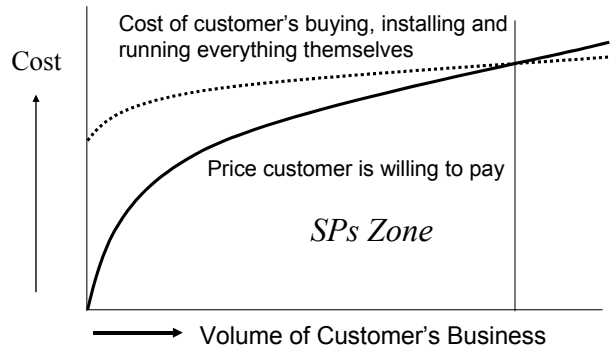

Figure 2-24: Cost Motivation for using Service Providers

Although different SP models are of interest to us, we concentrate on ASPs due to the key role ASPs are playing in EC/EB.

2.11.3 ASPs – A Closer Look

As stated previously, an ASP (Application Service Provider) hosts business aware application components. The ASP Consortium definition is:

"An Application Service Provider (ASP) manages and delivers application capabilities to multiple entities from a data center across a wide area network."

A variant of this definition by Gartner Group links ASPs with outsourcing: "ASP market is the delivery of standardized application software via a network (though not particularly or exclusively the Internet) and through an outsourcing contract predicated on usage-or transaction-based pricing." (Source: Davis, M. et al, "Using an ASP: What are the Risks and Benefits?", Gartner Research Note, 10 January 2000).

Figure 2-25 shows a conceptual view of a large scale ASP that provides a wide range of business applications.

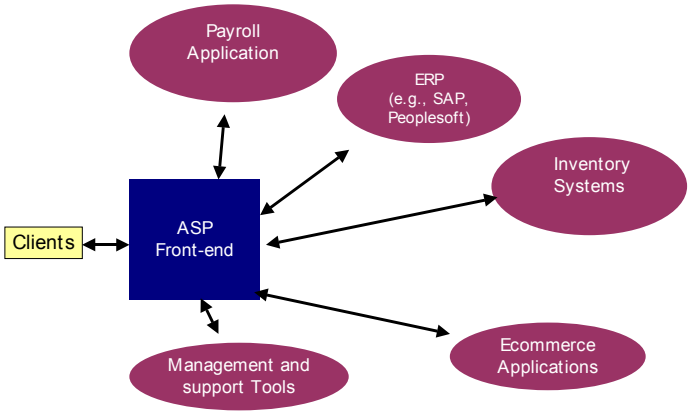

Figure 2-25: Conceptual View of an ASP

The ASP business model is service and subscription-based. The clients of an ASP pay a fee, depending on the type of application and number of users, to use the application over a wide area network. For example, a user that needs to use an SAP application for a few months but does not want to purchase SAP, can "rent" the use of SAP from an application service provider. It is also possible for a user to rent applications from different ASPs depending on the application needs and the ASP fees. Different ASPs have different fee structures. For example, some ASPs only cater to large customers that need support for more than 100 users for more than a year, while others provide a daily and weekly rate. The types of applications also vary widely. At present, you can find an ASP for almost any type of application – including desktop applications (e.g., word processing), games, and serious business applications such as payroll, asset management, and inventory control. Most major software vendors such as SAP, Oracle, and Peoplesoft are becoming ASPs.

The ASP industry is, growing in "Internet time" because this model appeals to many IT managers. According to a Computerworld survey, one third of IT managers will rent applications if they can. An IDC survey (1Q 2000) indicates that the ASP market will grow from $150 million in 1999 to $2 billion in 2003. However, due to a plethora of ASPs (a dozen new arrivals per month at the time of this writing), it is impossible for IT decision makers to choose. It is difficult to keep up with the different offerings, value propositions, and business policies of so many firms in order to select the very best ASP to meet their needs. ASP emphasizes server side software, i.e., complex software such as application servers, Enterprise Java Beans (EJBs), workflow engines, enterprise application integrators, and message brokers all reside at the server sites. The clients are relatively light weight, i.e., they use a minimum of application specific software on the client side ("thin clients"). This thin client model allows even the smallest companies to take advantage of the ASP marketplace.

2.11.4 Classifications of ASPs

Some early ASPs provided Lotus Notes over a network (e.g., Interliant). At present, email and groupware are commonly delivered by ASPs[2]. Then came "application hosters" that provided complete life cycle support (e.g. development, maintenance, operation) of business applications. This has evolved into large scale enterprise applications such as SAP, Siebel, and Peoplesoft delivered over the network. In addition, several Internet driven companies have positioned themselves as ASPs for emarketplaces. At present, a wide range of portals and dot coms provide ASP services and a plethora of ASPs exist with different types of solutions, range of services and customer focus.

Many enterprises find it difficult to make sense of the cluttered ASP marketplace. We present a few views. Figure 2-26 suggests a taxonomy, from an ASP user point of view, that casts ASPs into two types: corporate

[2] In our view, Lotus Notes and groupware are middleware services and should not be thought of as applications (we think of applications as business aware data and programs). This point will be discussed later.

computing driven and Internet driven. The corporate computing driven ASPs are further subdivided into the following categories:

- Enterprise ASPs that provide a brand name package or suite developed by a vendor, e.g., PeopleSoft, SAP, Corio, Futurelink, Usinternetworking, IBM Global Services, Qwest Cyber.Solutions
- Desktop ASPs that provide a complete out-sourced computing environment including desktop applications, e.g., Telecomputing
- Vendor ASPs where the ISV (independent software vendor) acts as its own application provider, e.g., Oracle Business OnLine, Mincom and numerous vertical market ISVs

The Internet driven companies are classified into:

- Emarket and E-commerce ASPs. These ASPs focus on commerce networks and electronic marketplaces. Examples of ASPs are Rightworks.com, CommerceOne, Ariba.net, etc.
- Portal ASPs. These ASPs aggregate content, applications and e-commerce to provide a full range of value-added services, usually focused on narrow markets, e.g., Portea Systems, Healtheon and Employease.
- Internt Corp ASPs. These ASPs, often not conceived explicitly as an ASP, provide Internet services such as Web building (e.g., iCAT, Sitematic and Zy.com), Telephony and unified messaging (e.g., eFax.com), and other net-based business apps (e.g., Upshot.com and NetLedger).

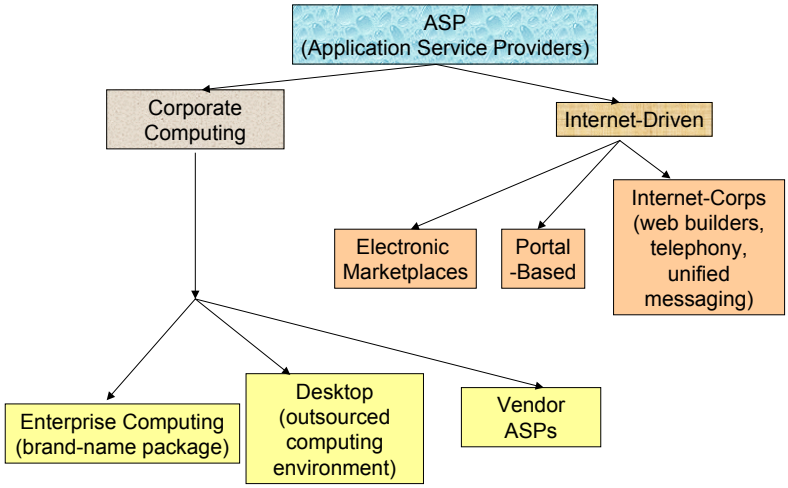

Figure 2-26: A Taxonomy of ASPs (Source: Phil Wainewright, "Anatomy of an ASP: The new computing Genus")

Figure 2-27 shows another view, from a market segmentation point of view. According to this taxonomy, the ASPs are either full service (i.e., provide a wide range of application services) or focused (i.e., concentrate on one type of applications such as telecom). In addition, the ASPs can be agnostic (i.e., they are being developed solely for the purpose of being an ASP and do not have any alliance to any application package), or allegiant (i.e., they only host applications from a single vendor, mostly their own). For example, Corio is an agnostic ASP while Oracle, IBM, and SAP are allegiant ASPs.

Another classification, shown in Figure 2-28 is presented by Gartner to help the customers select an ASP. This classification, combined with the previous two, can be used to suggest the following factors for selecting an ASP:

- What is the customer focus of the ASP, i.e., is the ASP concentrating on small rapidly growing companies or large established organizations?
- What is the breadth of service offered by an ASP, i.e., is the ASP focusing on a few selected packages (e.g., back-office software) or everything from front to back-office? Focus on vertical versus horizontal markets is also important.

- What is the range of services being offered, i.e., is the ASP concentrating on operation only or providing entire life cycle support (e.g., analysis, design, development, testing, maintenance, and enhancements of applications)?
- Software licensing and total cost of ownership issues
- Is the ASP vendor agnostic (vendor neutral) or allegiant (vendor specific) (Figure 2-27)?
- Is the ASP corporate or Internet driven (Figure 2-26)?
- ASP customer service record and ability to meet new needs
- ASP staying power

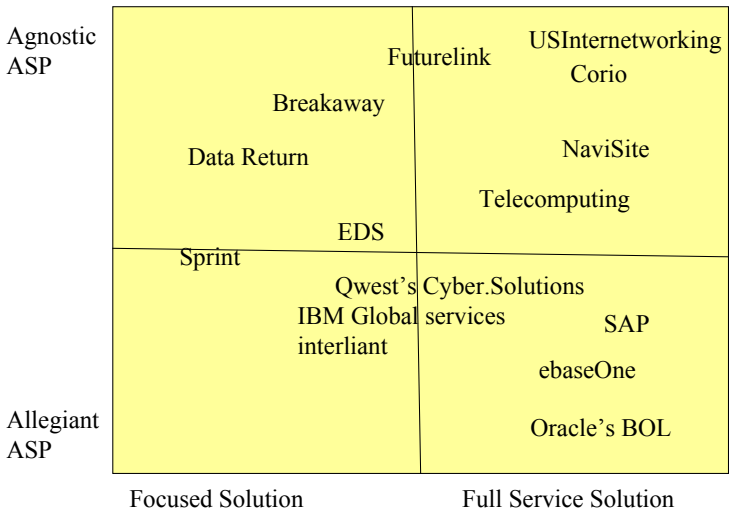

Figure 2-27: ASP Market Segmentation (Source: "Application Service Provider Market", A.G. Edwards Report, Dec. 1999)

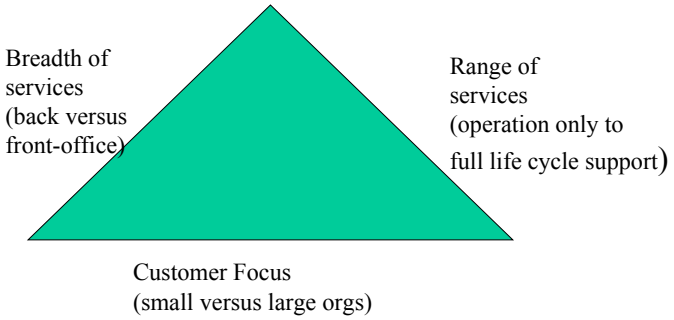

Figure 2-28: Classification for Selecting ASPs (Source: "Coming Your Way - ASPs", Gartner, Feb. 2000)

2.11.5 Why are ASPs so Popular?

Basically, ASPs represent a new channel for application and service delivery to businesses of all sizes. The ASP is a powerful new model, moving the locus of information processing to a hosted environment, and transforming what was once a product into a service. The main attraction of ASPs is that they save installation and maintenance costs (see the sidebar "Total Cost of Ownership"). Other reasons are:

- **Software Is Becoming a Service**: ASPs are starting to promote business services with software applications as a foundation, rather than touting a cost-effective hosting service. Example: vertical portals.

- **Suppliers Are Driving The Industry**: Market acceptance, though initially tepid, will increase with more replicable successes and larger numbers of referenceable customers, and will only accelerate the industry's expansion going forward.
- **e-business Imperatives/Core-business Drive Markets:** Large companies are outsourcing internal, non-core functions and smaller organizations and rapidly growing companies are tending to outsource most or all of their IT infrastructure to better concentrate on their lines of business.
- **Dot-com initiatives:** "dot-coms" are the biggest adopters of the outsourcing trend due to their reliance on IT.
- **New Generation Of ASPs Focus On Specific Vertical Markets**: (e.g., healthcare). Vertical-industry focus on the part of ASPs - especially those smaller service providers coming to market now - is growing.
- **Rapidly Growing Companies Are ASP Pioneers:** Small to mid-sized enterprises, for whom managing growth is a constant problem, are pioneering users of ASPs by outsourcing most or all of their IT departments.

Total Cost of Ownership

In-House vs ASP Installation
- In-House Purchase and installation $100,000
- ASP-Startup Fees $ 25,000

In-House vs ASP: Maintenance per year
- Maintenance (3-4 times initial purchase) $300,000
- ASP- rental fees (multiple of seats by month) $250,000

(Source: "Application Service Provider Market", A.G. Edwards, Dec. 1999)

2.11.6 ASP versus other SPs

Suppose you are an ISP (Internet Service Provider) - should you become a platforms service provider, (i.e., provide a platform for e-commerce) or an ASP? If you become a PSP, then you will have to provide middleware needed, for example, to support e-commerce, in addition to the network and Internet services commonly provided by an ISP. This middleware resides above Web and network services and supports services such as the following:
- Catalog services needed for e-commerce
- Digital or other payment support
- Internet transactions
- Integration with back-end billing, payment and reconciliation systems

An Application Service Provider hosts application components that reside above platform services (computers, middleware). So an ASP is typically a PSP (i.e., somewhat similar to the traditional computing center model) plus an application hoster.

One school of thought is that ISPs are making a strategic business mistake by becoming ASPs. Here are some suggested reasons:
- Selling of applications such as Oracle Applications, SAP, Peoplesoft requires deep application know-how that is not easy to acquire.
- ISPs should focus on extending the infrastructure to serve their customers and not get into the ASP market.

- Many large ASPs such as Corio, Asera, Ariba, and Usi have the knowledge to sell, maintain and manage applications such as Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP).
- Business applications are not core competencies of ISPs. They should focus on infrastructure.
- Network operations and computing facilities maintenance are fundamentally different from back office application operations.
- ISPs may be competing with their customers because many ASPs use ISPs to provide network access.
- Running global "data centers" with 24x7 operations with solid operability (security, scalability, manageability) for different types of applications could be big business for ISPs.

However, there are several reasons for ISPs and other software companies to become ASPs. Here are some:

- ASP is a large area of growth -- around 9 Billion per year, according to the ASP consortium (www.aspindustry.org).
- ASP savings for customers can be significant – they range from 33% to 53% over purchasing, according to the ASP Consortium.
- Almost anything can be provided through ASP (word processing to supply chain management). Thus you can start small and gradually evolve.
- Becoming an ASP is a survival issue for many software companies that cannot sell their expensive software to small startups. This is true for most companies whose application software is too expensive and too large for some customers.
- If your expertise is in applications, then becoming an ASP is an attractive choice. This is especially true if you can leverage existing communication capabilities and add applications that you know well on top of the existing infrastructure.
- If you already have applications, the ASP model gives you the benefits of quick deployment and reduced time to market.

How Quickly do ASPs Respond to Support Calls?

Customer service is a key issue in ASPs. According to a Zona Research survey conducted in the first quarter of 2000, only 16% of the ASPs responded to their customers within 15 minutes, while 44% responded within an hour, and 40% within 4 hours.

2.11.7 Why Use an ASP?

The decision to use an ASP should be made only after firmly understanding the pros and cons. From a customer's point of view, the ASP model is very attractive because the customer can [Davis 2000, O'Rourke 1999]:

- Decrease and control cost. Companies can avoid a startup cost and pay as they grow. The costs of application maintenance are more predictable and controllable because many ASP contracts are based on usage-based monthly fees.
- Outsource application development and maintenance. Your staff can be free to do other things while ASPs develop and maintain (with some enhancements) the applications. The level of enhancement should be agreed upon as part of the contract.
- Decrease implementation time and reduce time to market. Your applications can be deployed quickly. Several ASPs can provide access to applications in matter of weeks. Quick deployment of application dependent services also reduces time to market (for extra fee, some ASPs promise to provide you with apps within a week).
- Improve reliability and scalability (RAS). It is easier for an ASP to provide RAS features than individual users. ASP clients get pre-configured and tested applications.

- Have access to better software because ASPs have to continually improve their software to stay competitive.

However, the customer must understand and manage the risks of ASPs. Here are some considerations:

- The ASP model is new so there may be some surprises. Many issues in pricing, privacy, and service agreements are open.
- Getting used to mission critical applications being outsourced is not easy.
- Security, privacy and trust are of fundamental importance. How do you know that the ASP will not divulge your private databases and information to your competitors, albeit inadvertently? In some industries such as healthcare, the leak of private information is extremely serious.
- There are many unknowns about the ASPs survivability in this volatile business. What happens to the customers if this model does not succeed?
- ASPs may not be able to integrate their applications with your legacy systems. This could create serious problems if you rely heavily on legacy systems.
- Outsourced applications may not be customizable. Thus, if you need customization, outsourcing may not be the best choice because applications requiring a large amount of customization are not good candidates.
- There is a plethora of ASPs, with almost a dozen new arrivals per month. Differentiators are needed to select the best. In addition, some ASPs lack the experience to deal with mission critical applications.
- The ASPs you rent from must have domain knowledge to be effective – it is a good idea to rent telecom applications from companies with telecom experience.
- RAS (reliability, availability, serviceability) factors should be considered when choosing an ASP.
- Administration and customer service of ASPs are also important. A Zona research survey indicates that ASPs need to improve their responsiveness (see the sidebar "How Quickly do ASPs Respond to Support Calls?")

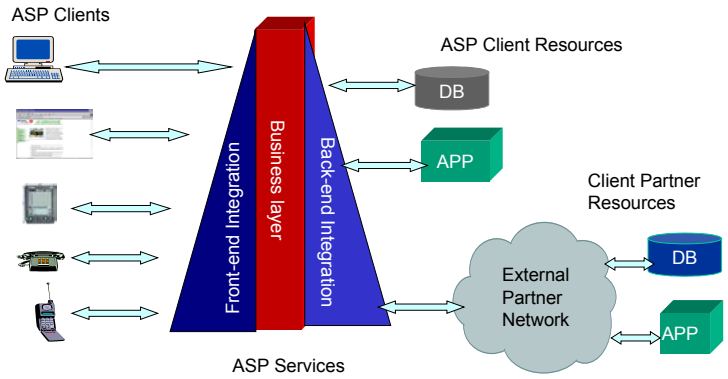

Figure 2-29: High Level Architecture of ASPs

2.11.8 Architectures of ASPs

Many software packages are becoming commercially available for development and deployment of ASPs from vendors such as Corio. Many ASPs at present provide a "portal" type access to the applications being provided (hence the term "ASP portal"). The customers access these applications through the ASP front-end based on security and access rules. The ASPs may house the applications and may also directly connect with remote applications through an integration layer (i.e., become an ASP gateway). Figure 2-29 shows, hopefully by now a familiar, architecture that is yet another specialization of the architectural framework shown in Figure 2-2. According to this architecture, the front-end of an ASP must be able to handle multitude of users and devices while the back-end must be able to communicate with multiple applications. The middle tier provides the security and access control.

2.11.9 Issues and Trends in ASPs

The following is a summary of observations from various ASP sources (e.g., www.aspnews.com, www.aspforum.com, Northeast Consulting Workshop on Net-Hosted Applications, Fall 1999):

- ASPs will have to deal with inter-company EB outsourcing.
- ASPs will have to shift focus to business services instead of apps.
- In a few years, inter-company EB activities will become automated transactions thus causing restructuring of ASP businesses.
- Standardization in data models, application integration, and business processes will be the key enablers of Inter-company EB SPs.
- Partnerships will be critical to ASP success.
- Equipment and software suppliers to ASPs will have to adopt flexible charging schemes with long term relationships.
- Brand names of apps will be invisible to users -- will be replaced by brand names of ASPs.

As stated previously, ASPs fall into various broad classes: a) Enterprise ASPs that provide a brand name package or suite developed by vendor, e.g., PeopleSoft and SAP, b) Desktop ASPs that provide a complete out-sourced computing environment including desktop applications such as Telecomputing, and c) Vendor ASPs where the ISV (independent service vendor) acts as its own application provider such as Oracle Business OnLine.

Sources of Information for ASPs

- ASP News Review (www.aspnews.com): ASP News Review is a good source of news, analysis and information for and about the Application Service Provider (ASP) industry.
- ASP Street (www.aspstreet.com): A growing site with usual news and publications sections, directory with profiles, Classifieds, ASP Industry Glossary, FAQ, etc.
- ASP101 (www.asp101.com): Getting Started in ASP
- ASP Forum (www.aspforum.cm): a forum for ASP users
- Market research and analysis reports from Gartner, Aberdeen, and Ovum

Time to Take a Break

- ✓ Portals and CRMs
- ✓ Online Purchasing and eMarkets
- ✓ ERPs and Supply Chain Management
- ✓ Data Warehouses and Outsourcing
- Mobile Applications and M-Commerce

Suggested Review Questions Before Proceeding

- What are data warehouses and what roles do they play in e-business? What specific problems do they address?
- How is data mining and Web mining related to data warehousing?

- Why is outsourcing important in today's IT environments?
- In a given organization, what functions can be outsourced and what types of service providers exist in the IT landscape?
- What are ASPs and what role do they play in modern e-business environments?
- List some examples of ASPs that you are familiar with

2.12 Mobility and Mobile Applications

An area of increased E-business activity is the mobility of customers, businesses, suppliers, and employees. There are different views, technologies, issues and architectures of mobility. We will discuss the following:

- Mobile e-business applications (MEBAs)
- Mobile e-commerce (M-Commerce)
- Positional commerce *(P-commerce)*
- Voice commerce (V-commerce)

For all practical purposes, mobile applications are not fundamentally new applications. Instead, mobility is another aspect (dimension) of the existing EB/EC applications.

2.12.1 Mobile Enterprise Business Applications (MEBAs)

An EBA (enterprise business application) is a set of business software applications that provides functionality and services for the key front- and back-office initiatives of modern enterprise. EBAs include enterprise resource planning, customer relationship management, and supply chain management applications, among others.

Mobile Enterprise Business Applications (MEBAs) add the mobility dimension to EBAs. MEBAs enable the core enterprise applications (ERPs, SCMs, CRMs, etc.) for availability to employees, partners, and customers who could be roaming around the globe. This idea may seem potentially threatening to some, but MEBAs are becoming a reality very quickly. Use of mobile devices such as laptop computers, personal digital assistants (PDAs), and digital telephones with Internet and wireless data access capabilities is widespread. The ability to support these highly mobile devices as part of an extended enterprise application strategy is critical. The mobile e-Business applications enable mobile customers to conduct transactions with their financial services, telecommunications, or product suppliers of choice.

MEBAs create many opportunities such as business and revenue growth, support for new types of customers, and conformance to different social models of how and where business is conducted. But MEBAs also introduce several risks. Security and unauthorized access is a natural issue. In addition, highly mobile organizations need to manage the scores of laptops, as well as the data held on mobile devices. In particular, these organizations need to handle data synchronization, file distribution, software distribution, and systems management tools needed for mobile applications. This problem will only grow as more and new types of devices become part of the extended enterprise. Some companies such as Synchrologic, Inc., provide tools to manage the synchronization, distribution, and control of data to mobile users on a variety of devices (see the book "M-Business" by Kalakota and Robinson, McGraw Hill, 2002; and "Mobile Enterprise Business Applications", Aberdeen Report, Jan. 2000).

The Internet infrastructure of the mobile enterprise needs to deliver access to corporate information, data, and services to users regardless of location or device type. The architecture must also handle data transfer, file access and distribution, and synchronization throughout the system. This architecture should accommodate all of the device types used to manage data remotely and should also be designed to provide an access point - ideally, a portal - that will serve as an entry point for users.

Selected References on Mobility

Kalakotta, R., and Robinson, P., "M-Business", McGraw Hill, 2002.

Dharwan, C., "Mobile Computing - A Systems Integrator's Handbook" McGraw-Hill, 2000.

Milojicic, D. S., Douglis, F. (Editor), Wheeler, R. G., "Mobility: Processes, Computers, and Agents", Addison-Wesley Pub Co, April 1999.

Peter Fingar, Harsha Kumar, Tarun Sharma, "Enterprise E-Commerce", Meghan Kiffer, January 2000.

Walker, J. (Editor), "Advances in Mobile Information Systems", Artech House Mobile Communications Library, December 1998.

Helal, A. A. (Editor), et al, "Any Time, Anywhere Computing: Mobile Computing Concepts and Technology", Kluwer International Series in Engineering and Computer Science.

Sampei, S., "Applications of Digital Wireless Technologies to Global Wireless Communications", Prentice Hall, 1998.

Some Links:

- Mobile Info Web site (www.mobileinfo.com).
- www.redherring.com/discussions/ -- a good site for Red Herring magazine. Search for articles on "mobility" or "mobile".
- Mobile Commerce Trends site (maffin.net/mobile-commerce/sample.htm) – you may have to sign up.
- http://www.wirelessweek.com/ -- Web site for wireless news.
- URL: www.gmcforum.com/ -- Web site for global commerce.com .
- URL: www.mobile-commerceworld.com/mobilecomuk2000/ -- mobile commerce world site.
- Wap forum (www.wapforum.org).
- www.ericsson.com .
- www.nokia.com .

2.12.2 Mobile Commerce (M-Commerce)

M-Commerce describes the growing phenomenon of using wireless mobile devices such as digital phones and PDAs to search the Internet, access data and information, and conduct purchasing or business transactions. M-Commerce is fueled by the extreme popularity of mobile devices such as laptop computers, cellular phones, PDAs (personal digital assistants), and palm pilots. However, the vast majority of devices and usage continue to depend on laptops and PCs, which may remain the de facto standard of devices used to access enterprise data and applications. Although the mobile PDA and telephone device markets are growing rapidly, the growth in the North American market is slower than in the European and Japanese markets.

Here are some examples of m-commerce:

- You never have to wrestle with cables to connect to e-commerce sites. You can connect your mobile devices to any e-commerce site.
- You could connect to your corporate network or surf the net for bargains while waiting in the doctor's office, having your car serviced, or even traveling around the globe.
- Your docked mobile PC and PDA could automatically synchronize your purchasing information as soon as you walk through your office door.

What is needed to make m-commerce a reality? Here are some ideas:
- Wireless networks. At present, 3G and Bluetooth are two top contenders.
- Middleware such as Wireless Application Protocol (WAP)
- Innovative new applications that are unique to mobiliy. For example, positional commerce (see next section).
- Wide use of handset devices to conduct business. Nokia predicts that by 2000 people will use mobile telephones to access the Internet more often than they use personal computers.

Why M-Commerce. The wireless Internet has many features that permit mobile interactive services to be more personalized than traditional Internet applications are.
- Mobile telephones are carried by their owners almost everywhere and kept switched on most of the time (especially in Europe, where mobile users aren't charged for incoming calls). Consumers can thus not only gain access to wireless services wherever there is a network presence but also keep tabs on time-critical information, such as stock market reports or urgent messages.
- Wireless-network operators -- at least those using the GSM standard -- are uniquely able to determine the identity of a user. Since mobile telephones are not usually shared, and a personal-identification number often protects them, the telephone itself can be used as a means of identification.
- Operators can detect a user's exact location, enabling a whole range of new applications.

2.12.3 Voice Commerce (V-Commerce), Positional Commerce *(P-commerce), and TV Commerce (T-Commerce)*

Voice commerce (v-commerce) is gaining in importance to support users who want to use telephones and other voice-driven devices for conducting e-commerce. For example, while driving or walking, it is easier to use a telephone than a computer. Technologies and standards such as Voice over IP (VoIP) and Voice Markup Language (VML) will play a key role in v-commerce.

Positional commerce *(p-commerce)* is becoming popular to provide support to the customers based on their geographic position (e.g., give you information about deals in the Boston area when you are in Boston). The systems use a GPS (Geographical Positional System) to locate the position of the customers. In addition to GPS, wireless access is at the core of mobility support – thus developments such as the Wireless Application Protocol (WAP) and Wireless Markup Language (WML) are playing a key role in this area. In addition, mobile agents are being employed widely to support p-commerce.

T-Commerce (TV-Commerce) is another area of work that involves mobility. The idea is that you can use your TV to do purchasing. For example, if you see an advertisement of a product on TV, you can then activate a purchase through your remote control. The TV set boxes will be programmed to support T-Commerce.

Figure 2-30 illustrates a positional and voice commerce application. The wireless and wired devices (with and without GPS support) are connected to a Feature Server that consults a GIS (Geographical Information System) map for GPS support. The Feature Server also does interactive voice response, voice recognition & speech generation. The Voice Portal provides voice menus or directory for users to select or traverse services. Based on this information, the back-end applications are accessed. These applications may reside in the Application Server that provides various transaction services (e.g. shopping carts, form requests) or may be part of a trader network.

An interesting example of PV (positional and voice) commerce is the "Commotion" prototype, developed at the MIT Multimedia Laboratory. This prototype captures the sites you visit most frequently, e.g., your home, your office, your grocery store, and your bank. Then the items most relevant to the site where you are at present (or close to) are automatically retrieved and "spoken" to you. For example, if you are driving by the grocery store, the system will remind you that you need to buy groceries.

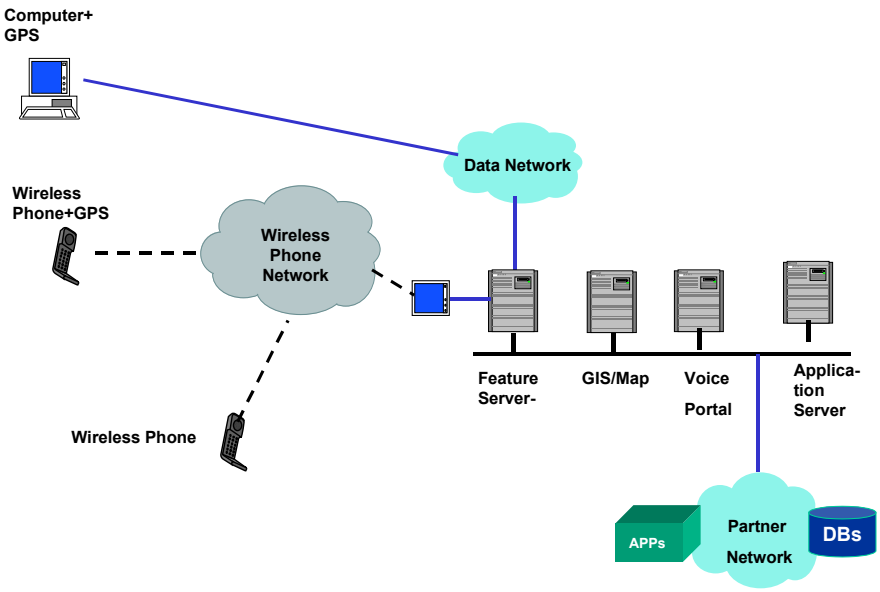

Figure 2-30: Positional and Voice Commerce

2.12.4 Architectures for Mobile Applications

Basically, the Internet infrastructure of the mobile enterprise needs to deliver access to corporate information, data, and services to users regardless of location or device type. The architecture must also handle data transfer, file access and distribution, and synchronization throughout the system. This architecture should accommodate all of the device types used to manage data remotely and should also be designed to provide an access point -- ideally, a portal -- that will serve as an entry point for users.

Figure 2-31 shows a conceptual view of mobile e-business applicaions and M/V/P-commerce. The main difference is at the front-end integration. This layer must perform two functions: a) view integration for various devices and b) mobility specific processing. View integration takes into account the various types of mobile devices. For example, the mobile Web browsers, telephones, PDAs, and palm pilots must be supported so that they can access the same type of back-end applications and databases as the wired ones. The Feature Gateway and Voice Portal are part of this function. Mobility specific software is responsible for "roaming support" (e.g., the GIS Map for GPS) and provides uniform access of CRM, ERP and proprietary or custom-developed business/commerce applications. It should include the following:

- Data synchronization, including between PDA devices, laptops, and server-based systems;
- File distribution, including the ability to refresh commonly used or accessed data files with updated information;
- Software updates and software distribution, particularly important for client-server-based enterprise applications that require periodic upgrades; and
- Portal-based entry into data repositories, which will provide a central point of presence for both internal and external users to identify, retrieve, and synchronize information.

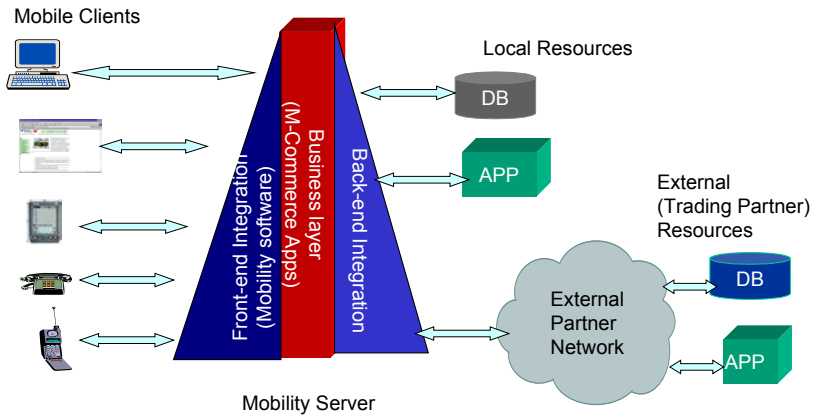

Figure 2-31: Conceptual Architecture for Mobile Applications

2.12.5 Mobility Trends

The merging of EB, EC, and mobile devices is an interesting area of work that will demand new architectural considerations. In addition, improvements in the wireless networks will enable new wireless applications. Growth of standards such as WAP and VML (Voice Markup Language) is another interesting area to watch. The concept of p-commerce (positional commerce) is not fully developed yet. Another area to consider is mobile agents. Due to the potential growth and interest in this area, we have briefly reviewed the key ideas here and will devote a complete chapter to this topic later.

Selected References on Mobility

Kalakota, R. and Robinson, M., "M-Business", McGraw Hill, 2002.

Dharwan, C., "Mobile Computing - A Systems Integrator's Handbook", McGraw-Hill, 2000.

Milojicic, D. S., Douglis, F., (Editor), Wheeler, R. G., "Mobility : Processes, Computers, and Agents", Addison-Wesley Pub Co, April 1999.

Fingar, P., Kumar, H., Sharma, T., "Enterprise E-Commerce", Meghan Kiffer, January 2000.

Walker, J. (Editor), "Advances in Mobile Information Systems", Artech House Mobile Communications Library, December 1998.

Helal, A. A. (Editor), et al, "Any Time, Anywhere Computing: Mobile Computing Concepts and Technology", Kluwer International Series in Engineering and Computer Science.

Sampei, S., "Applications of Digital Wireless Technologies to Global Wireless Communications", Prentice Hall, 1998.

Mobile Info Web site (www.mobileinfo.com).

Suggested Review Questions Before Wrapping UP

- What is M-P-T-V Commerce? Give one example for each. Why are they important?
- What are MEBAs and why are they important?
- Is the following statement true: more fundamentally new mobile applications will be developed in the future instead of mobility as another feature of existing applications. Why or why not?

2.13 Hints about the XYZCorp Case Study

Most of the questions raised in the case study (Section 2.2) involve an analysis of the applications discussed in this chapter (i.e., CRMs, ERPs, SCMs, emarkets, ASPs, portals, mobile apps). Based on analysis of EB applications, an understanding of the company business and its strategic goals, you can prepare a table that lists the candidate applications and describes why each will be specifically needed by the company (each application is represented as a row). Table 2-3 shows a sample table. **It is extremely important to concentrate on applications that are business aware.** You should briefly review the methodology discussed in the next chapter to understand how these applications could be linked together graphically.

Table 2-3: e-Business Applications for XYZCorp

EB Applications	Why Applications will be Used in XYZCorp
Web advertising and Portals	Needed for the company products as an additional sales channel
Customer Relationship Management (CRM)	Important for customer retention
Online Purchasing and EProcurement	Important to provide 24X7 purchasing without having to increase staff
Electronic marketplaces and trading hubs	This may not be needed initially. Should be placed in the long range plan
Supply Chain Management	Important to cut down the production time and the time to serve customers
Enterprise resource planning (ERP) systems	Important for internal efficiencies
Data Warehouses and Data mining	Should be developed to support the CRM
Outsourced applications	It may be possible to outsource ERPs
Mobility and mobile applications	MEBAs (mobile e-business apps) are needed especially to support customer facing (C2B) apps

2.14 Chapter Summary

This chapter has quickly reviewed the e-business applications and models that are at the core of modern enterprises. These enterprises rely heavily on the Internet-based infrastructure to conduct business. Basically, the partners in these enterprises are consumers and businesses that support C2B, B2B, C2C, and C2N interactions. The exchanges between the players (consumers and businesses) typically involve the following aspects:

- Portals
- Customer Relationship Management (CRM) and Self Serve Customers
- Online purchasing
- Intermediaries such as electronic marketplaces and trading hubs
- Supply Chain Management
- Enterprise Resource Planning (ERP) systems
- Service Providers (e.g. ASPs)
- Mobility

We have briefly scanned these topics in this chapter and have shown an architectural framework consisting of two integration layers (back-end, front-end) and a middle business layer that can be used to represent many of the EB applications and models.

2.15 Additional Information

Aberdeen Group, "The e-Business Marketplace: The Future of Competition" Executive White Paper, April 2000.

Acharya, R., "EAI: A Business Perspective", eAI Journal, April 16, 2003

Bakos, Y., "The Emerging Role of Electronic Marketplaces on the Internet". CACM, Vol. 41 No.8, August, 1998.

Bakos, Y., Bailey, J. "An exploratory study of the emerging role of electronic intermediaries", International J. Electronic Commerce 1, 3, Spring 1997.

Bailey, J., Brynjolfsson E., "In search of friction-free markets: An exploratory analysis of prices for books, CDs and software sold on the Internet", In Proceedings of the 25th Telecommunications Policy Research Conference, Alexandria, VA, Sept. 1997.

Berson, A., "Building Data Mining Applications for CRM", McGraw-Hill, 2000.

Caruso, V., "The Evolution of Transaction Based Databases", http://www.ee.uts.edu.au/ise/homepages/hmpgs95a/vcaruso/dbhist.html .

Chabrow, E.,"Supply Chains Go Global", Information Week, April 3, 2000.

Cooper, M. C., and Ellram, L. M., "Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy", The International Journal of Logistics Management, 4, 2, 13-24, 1993.

Davydov, M., "Corporate Portals and e-business Integration", McGraw-Hill Professional Publishing; 2001.

Davis, M. et al, "Using an ASP: What are the Risks and Benefits?", Gartner Research Note, 10 January 2000.

Dyche, J., "The CRM Handbook: A Business Guide to Customer Relationship Management", Addison-Wesley, 2001.

Elsenpeter, R., and Velte, T., "e-Business: A Beginner's Guide", McGraw-Hill Professional Publishing; 2000.

Erickson, G., and Rothberg, H., "B2B Internet Applications: Strategic Considerations", Competitiveness Review, Summer-Fall 2002

Gable, J., "Enterprise Application Integration", Information Management Journal March-April 2002

Ganeshan, R. and Harrison, T., "An Introduction to Supply Chain Management", Supply Chain Management Review, 1995.

Greenberg, P. "CRM at the Speed of Light: Capturing and Keeping Customers in Internet Real Time", McGraw Hill, 2001.

Gulledge, T., "B2B Emarketplace and Small- and Medium-sized Enterprises", Computers in Industry, Sept 2002

Hamilton, S., "E-Commerce for the 21st Century", IEEE Computer, May 1997.

Henderson, J. and Venkatraman, "Strategic Alignment: Leveraging Information Technology for Transforming Organizations", IBM Systems Journal, Vol. 32, No. 1, 1993, pp. 4-16.

IDC, "Conducting e-Business: A User Survey ", 2001.

Jap, S., and Mohr, J., "Leveraging Internet Technologies in B2B Relationships", California Management Review, Summer 2002

Kalakota, R., and Whinston, A., "Frontiers of Electronic Commerce", Addison Wesley, 1996.

Kalakota, R. and Robinson, M., "e-Business 2.0: Roadmap for success", Addison Wesley, 2000.

Kalakota, R. and Robinson, M., "M-Business", McGraw Hill, 2002.

Ketchpel, S., Garcia-Molina, H., "Making Trust Explicit in Distributed Commerce Transactions". 16th International Conference on Distributed Computing Systems (DCS96), 1996.

Ketchpel, S., Garcia-Molina, H., "Distributed Commerce Transactions with Timing Deadlines and Direct Trust". IJCAI 1997.

Lee, J., Siau, K., and Hong,S., "Enterprise Integration with ERP and EAI", Communications of the ACM Feb 2003

Lim, W., "Cost-Benefit Analysis of component-Software", eAI Magazine, April 16, 2003

Luftmann, J., "Competing in the Information Age: Strategic Alignment in Practice", Oxford University Press, 1996.

Magretta, J., "The Power of Virtual Integration: An Interview with Dell Computer's Michael Dell", Harvard Business Review, March-April 1998.

Simchi-Levi, Kaminsky and Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies", Irwin/McGraw-Hill, (1999).

O'Rourke, M., et al, "Application Service Provider Market", A.G. Edwards Report, Dec. 21, 1999.

Shea, P. "New opportunities in ecommerce", Australasian Business Intelligence Jan 24, 2003

Stylianou, A., et al, "Perceptions and attitudes about eCommerce development in China: an exploratory study", Journal of Global Information Management April-June 2003

Simchi-Levi, Kaminsky and Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies", Irwin/McGraw-Hill, (1999).

Steinauer, D.D., S.Wakid, S.Rasberry, "Trust and Traceability in Electronic Commerce". StandardView vol. 5 n. 3, Sept. 1997.

Shunter, M., and Waidner, M., "Architecture and Design of a Secure Electronic Marketplace", Procs. JENC8: 8th Joint European Networking Conference, Edinburgh, May 12-15 1997.

Taylor, D., and Terhune, D., "Doing E-Business: Strategies for Thriving in an Electronic Marketplace". John Wiley, 2001.

Tennenbaum, J., Chowdhry, T., and Hughes, K., "Eco System: An Internet Commerce Architecture", IEEE Computer, May 1997.

Turban, E., et al, "Electronic Commerce: A Managerial Perspective", Prentice-Hall, 2002, second edition.

Tygar, J., "Atomicity in Electronic Commerce", Proc. of ACM Symposium on Principles of Distributed Computing, May 23-26, 1996.

Umar, A., "EC Bedrock", Database Programming and Design, Nov. 1997.

Umar, A., Elsinger, D., and Lai, M., "A Framework for Analyzing Next Generation Enterprises", Working Conference on Next Generation Enterprises, Buffalo, New York, April, 2000.

Wurman. P., "Dynamic Pricing in the Virtual Marketplace", IEEE Internet Computing, March-April 2001, pp. 36-42.